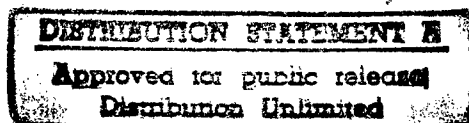


JPRS-UAC-89-007
14 SEPTEMBER 1989



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Soviet Union

AVIATION & COSMONAUTICS

No 1, January 1989

19980127 172

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

Soviet Union

AVIATION AND COSMONAUTICS

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14 September 1989

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AVIATION AND COSMONAUTICS

No 1, January 1989

Air Force Official on Flight Safety

91441174a Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 1-3

[Interview with Lt Gen Avn Ye. Rusanov, deputy commander in chief of the Air Forces and chief of the Flight Safety Service, by AVIATSIYA I KOSMONAVTIKA correspondent: "In the Interests of Combat Readiness"]

[Text] Lt Gen Avn Ye. Rusanov, deputy commander in chief of the Air Forces and chief of the Flight Safety Service, discusses some problems of flight safety in military aviator combat training in an interview with our correspondent.

* * *

[AVIATSIYA I KOSMONAVTIKA] Comrade Lieutenant General, on numerous occasions I have heard discussion of the correlation between the needs of mastering complex maneuvers in the course of military aviator combat training on the one hand and the requirements of flight safety on the other. It would seem that many years of military aviation experience would have provided all the answers. The debate continues, however. Sometimes it is even claimed that both these aspects of flying are in a state of unresolvable conflict and that one of them can reach a successful state only at the expense of pushing down the other, and vice versa.

[Rusanov] Yes, such statements are no rarity. It is obvious from the methodological standpoint that the authors of such statements on both sides are advocates of extreme views, who do not wish to acknowledge the need for and possibility of an optimal combination. But a no less interesting conclusion is also obtained from a professional point of view when you also hear such arguments time and again in the most diverse military units. They almost always arise not with planned, scheduled, fundamental discussion of these truly critical components of the state of affairs in an Air Forces unit and subunit or with a specific pilot, but only following an air mishap, when the accident inquiry is approaching the stage of determining causes and guilty parties.

Such preliminary debates are as a rule initiated by precisely those individuals (or their superiors) who have patently been guilty of deficiencies in choosing and executing essential and, as the inquiry shows, entirely reasonable measures to ensure the safety of a flight which has ended adversely.

Unfortunately such debates are at the present time not being provided adequate scientific and practical interpretation.

The results of the activities of many Air Forces support services and a number of other agencies and organizations, their achievements and shortcomings, are concentrated in such a complex issue as flight safety. But at the present time it is lacking adequate scientific and methodological backup and validation. There is currently lacking a unified, generally-accepted definition of flight safety which satisfies both theory and practice, and yet precisely such a definition would constitute a point of departure for a correct, balanced attitude toward the problem as a whole and toward its component parts in particular.

[AVIATSIYA I KOSMONAVTIKA] Variations of such a definition are in fact presented in various materials, for the most part not official documents prescribing standards. In these materials flight safety is frequently viewed as a property of the air operations system. For practical purposes, however, this is clearly not entirely specific. What other opinions are there on this matter?

[Rusanov] This formulation should be refined with the involvement of scientific establishments, most preferably the lead organization dealing with problems of flight safety. This is not the case at the present time; practical realities suggest the following definition.

Flight safety is the absence of air mishaps in the process of flight operations, secured by the quality of the aircraft and flight operations support assets and facilities, by the established rules and procedures of conduct of flight operations, as well as by the preparedness and efficiency of personnel at all levels of the organizational structure.

In this formulation it is important to stress the absence namely of air mishaps, not of accident-threatening situations, deficiencies, adverse comments and other negative phenomena in the dynamics of flight operations. Many of these exist, as we know. They occur in all support services, and commanders, superiors, and inspecting officers at all levels respond to them. But when doing preventive work in the interests of flight safety, one should bear in mind that the purpose of the entire aggregate of measures, requirements, and actions in this area should be prevention precisely of air mishaps and accidents, including crashes with fatalities. With a shifting of emphasis to number of near-mishap or mishap-threatening incidents, many officers tread a slippery path in evaluating the state of flight safety: failure to report such incidents. In the final analysis this results in air mishaps.

[AVIATSIYA I KOSMONAVTIKA] Can you cite a typical example of such a thing?

[Rusanov] Unfortunately they are numerous. For example, a pilot of a single-seat supersonic aircraft, while climbing out in clouds after takeoff and initial acceleration, failed to monitor his heading and lost his bearings due to cockpit equipment failure and lack of alertness by air traffic control. Fearing that they would write up a mishap-threatening incident against him, he failed to perform the procedures prescribed for such a situation.

He failed to switch to the special radar transponder mode and code, he failed to report his loss of positional certainty to his or any other control facility, and he failed to initiate a holding pattern. Attempting to regain his bearings on his own, a short time later the pilot emerged from the clouds and caught sight of an airfield operated by another agency. But here as well, failing to estimate distance to his home field, fuel remaining, and flying conditions, he again concentrated on a single thing—to avoid a write-up for this incident as well (unscheduled landing at another airfield). As a result, having "avoided" these two incidents, the officer ended up in an in-flight emergency situation—he was forced to bail out due to fuel exhaustion.

This is why one should not boil efforts to ensure flight safety down merely to combatting mishap-potential in-flight situations.

[AVIATSIYA I KOSMONAVTIKA] What is the meaning of the concluding part of the definition of flight safety where it states the requirement of preparedness and efficiency of personnel at all levels?

[Rusanov] This passage reflects the practical necessity of specifying jurisdiction and responsibility for flight safety on the part of various persons in authority within the overall structure of the Air Forces.

Among the great diversity of organizational variations of these levels, we can specify four: flight personnel, who are the ones directly doing the flying; the aviation regiment and flight operations support units; the aviation combined unit; the directorates and services at the central administrative level, combat training centers, and scientific research establishments.

Due to an imprecise understanding of the content of prerogatives (and, of course, possibilities of exercising them) pertaining to securing flight safety at each of these levels, there frequently arises a lack of specificity and overriding of rights and duties. As a consequence of this, for example, on an almost weekly basis the rank-and-file pilot is reminded of the general requirements of the highest party and government echelons pertaining to flight safety. And on the other hand, persons high in authority who have long since ceased flying and who possess only a superficial notion of the capabilities of aircraft of the latest generations are generous with their instructions on the professional finer points of limitations or, on the contrary, difficulties in piloting and combat flying.

[AVIATSIYA I KOSMONAVTIKA] How can one characterize, of course in the most general terms, the main element pertaining to flight safety in the activities of officers at each of the levels mentioned above?

[Rusanov] It is appropriate here to proceed from three basic components of flight safety, which in the proposed definition comprise an interlinked system: reliability of

aircraft and supporting equipment; precision of organization and conduct of flight operations; proficiency and efficiency on the part of all categories of personnel.

A specific feature in the functioning of this closed structure lies in the fact that the regimental levels—air regiment supervisory personnel and the pilots (aircrews) themselves—are closest to practical flight safety. Mishap-free flight operations depend in large measure on these personnel.

At the same time, with a high level of personal proficiency and professional caution, even in the presence of various adverse objective factors, these personnel have everything at their disposal needed for ensuring flight safety. Indisputable confirmation of this is the working experience of dozens of vanguard air regiments.

Air Forces staffs at a higher level should concentrate their efforts pertaining to flight safety in two principal directions: creation of maximally favorable conditions for air regiments to adhere most precisely to documents governing flight operations, as well as selection, training and indoctrination of sensible regimental-echelon supervisory personnel.

In my opinion precisely this, and not excessively close supervision and constant interference in the actions of subordinate commanders and even rank-and-file pilots, is the most reasonable practice for the higher-echelon command authorities. The results of investigation of many air mishaps convincingly demonstrate that a major role in their occurrence was played by deficiencies which had existed for an extended period of time, which should have been noticed and corrected by leader personnel at these echelons.

And, finally, the highest echelon—the central administrative staff—normally deals with the most general aspects of flight safety. They include assessing the quality of aircraft entering operational service, preparation, adjustment and revision of fundamental documents, and improvement of methods of training pilots and ground personnel. Neglected spots in these areas result in the most adverse consequences.

[AVIATSIYA I KOSMONAVTIKA] What is the most important thing for ensuring flight safety in coordination with personnel at the various echelons, each of which of course has its own tasks and its own approach to accomplishing them?

[Rusanov] This question can be answered quite simply. Nobody should under any circumstances forget about the importance of the requirements of flight safety and the irreversible nature of negative results from failing to observe these requirements. Then an optimal combination of these elements, taking aircrew safety into consideration, will be found in drawing up a specific standard for evaluating an element of flight training, in organizing an exercise involving actual sorties, and in allocating airspace.

A tragic incident which occurred during the conduct of a tactical air exercise in a bomber regiment will remain in my memory for a long time. The aircraft were equipped with a terrain following system, the function of which was to provide maximally effective employment of one of the most difficult tactics—approach to the target at extremely low level.

During preparations for a mission involving multiple aircraft, senior-echelon officials urged the regimental command element to ensure that each supervisor influence the actions of the aircrews within his area of responsibility, packing the mission with difficult elements. It was recommended that other tactics be employed in addition to terrain flight: brief, vigorous descent; maneuver with high bank angles; massive employment of jamming; complete radio silence. The regimental command element finally yielded to imposition of these additional elements. As a consequence two aircrews colliding with the ground.

Of course one should practice new and complex tactics. But assignment of each such mission must be reinforced with development, assimilation, and execution of requisite safety measures. The principle of meeting performance standards at all costs has become obsolete.

[AVIATSIYA I KOSMONAVTIKA] On the basis of experience in ensuring flight safety at the level of the Air Forces as a whole, what would seem to be the most important thing for each pilot, especially a pilot who is just beginning his career?

[Rusanov] Solid knowledge and flawless observance of two fundamental documents: the Manual of Flight Operations and an aircraft's operating manual. Unfortunately there occur far from isolated instances where, because of the great number of current documents and large number of various drills and exercises, some pilots go for weeks and even for months without working on these critical documents. When they find themselves in a difficult situation, they respond as best they can. And yet everything is spelled out in the appropriate documents. We cannot overemphasize their exceptional importance for every pilot.

There is a constant inflow of information on air mishaps and dangerous near-mishap situations, especially repeat situations with aircraft of the same type, as well as during typical phases of a training sortie (for example, during aerobatic maneuvers with fighters, on the air-to-ground range with fighter-bombers, at the tactical range with reconnaissance aircraft, etc). A personal study regimen could be as follows: study of details of the occurrence and development of a hazardous situation; sequence of actions by pilot and ground controller; variation of correct actions to counter a hazardous situation and save crew and aircraft.

[AVIATSIYA I KOSMONAVTIKA] What is your view on prevention of air mishaps? Some people claim that this

is a rather contrived term, that it is sufficient conscientiously to observe the requirements of the appropriate documents (applying extremely strict criteria), and there will be no more accidents.

[Rusanov] Such statements are made as a rule in the way of justification when work performance is found to be in a state of neglect in a unit or subunit. On the whole this thesis is backed up neither by theory nor practice, for even reliability of equipment, regardless of redundancy and backup arrangements, fails to achieve the desired probability figures. This applies to an even greater extent to flawless operator performance (pilot, technician, air traffic control specialist). Therefore, in addition to the established rules and procedures of preparing for and conducting flight operations, which, incidentally, in spite of the care with which they have been drawn up and formulated, also have their weak points, discovered in the course of practical operations, practical realities have dictated the need for additional measures to prevent air mishaps. They are generally recognized and formally articulated in documents, including the requirements of the USSR Minister of Defense and Commander In Chief of the Air Forces for 1989.

[AVIATSIYA I KOSMONAVTIKA] Apparently misconceptions about preventive efforts are a consequence of narrowness of theoretical and methodological substantiation of the content of flight safety?

[Rusanov] Of course. General goals, tasks, and principles of execution are much more precisely formulated in the prevention effort, for example, than its content and methods of accomplishment. And yet it is precisely these latter which are the most relevant for regimental, squadron and flight-level personnel, especially supervisors.

The experience of the best air units indicates that prevention of air mishaps is accomplished by the same measures which comprise the daily routine content of personnel combat training and commander activities—from training classes, drills, and study of information to moral influence by fellow personnel and disciplinary action against persons guilty of violating flight and process discipline. In contrast to measures planned and scheduled for the coming year, however, preventive measures are carried out on a current and flexible basis, proceeding from analysis of the current state of flight safety in the unit and taking into consideration newly-assigned flight training tasks.

First of all it is necessary to define the main direction (against what) and content of preventive efforts (what to carry out) at the given moment and to redistribute prior-scheduled training class topics and the directional thrust of drills and mission-specific training sorties. We are dealing here with foresight ability on the part of commanders as well as flight safety service officers.

One should also differentiate preventive efforts by levels, so to speak. For example, prevention of those air mishaps which are most probable for the current situation

within the "pilot-regimental commander" span. This includes reports pertaining to generally-formulated issues which cannot be resolved by the unit's resources.

[AVIATSIYA I KOSMONAVTIKA] Is it theoretically possible to achieve absolute flight safety with a combination of all methodological, organizational, disciplinary, and other measures?

[Rusanov] I should preface my reply with two points: the term "absolute safety" should be replaced with "assured safety," and we should define the limits within which this level of safety is to be achieved. Throughout military aviation as a whole? With an aircraft of a specific type? Within a given aviation regiment? With pilot Ivanov?

Let us now examine this question from achieved results—safety figures for last year. It seems that in the majority of cases air mishaps could have been prevented both prior to and even after the onset of an emergency situation. To accomplish this, officials of many services and levels should have taken the requisite preventive measures and actions. But unfortunately there was no such mutual support effort in evidence.

And yet thousands of pilots through their entire career and dozens of aviation regiments through many years of practical flight operations confirm that assured flight safety is a realistic possibility for the majority of aircrews, subunits, and units. What is needed is intelligent initiative.

[AVIATSIYA I KOSMONAVTIKA] Incidentally, speaking of initiative, what about those officers, from lieutenant on up, who are convinced that their suggestions and proposals are valid for the entirety of combat aviation?

[Rusanov] There is no doubt that a lieutenant can see and articulate a problem of current significance. At the same time I would like to state that when drawing up suggestions and proposals, their authors should determine the following: what is the overall state of affairs regarding the matter in question? Have similar suggestions and proposals been made in the past? What is the effectiveness, on the one hand, and the cost, on the other, of the proposed solution? What advantages and drawbacks of a proposal may come into play at the present moment and in the future? It is beneficial to discuss a proposal (prior to submission to higher authority) among one's colleagues.

There is no shortage of suggestions and proposals pertaining to flight safety. Many of them merit attention. But the majority focus on the future. And yet we cannot simply ignore the current state of affairs. In the overwhelming majority of instances it is determined by the state of discipline and efficiency on the part of flight and ground technical personnel, their proficiency and quality of organization of conduct and support of flight operations. If these are not considered, you can expect trouble. This is persuasively attested by a fatal crash last year involving an An-12 aircraft, which experienced failure of all engines while over the Sea of Azov. This aircraft was

a flying laboratory and was not intended for carrying passengers. Nevertheless the senior-level commander, in circumvention of the appropriate documents, ordered a personnel-carrying run. A lack of integrity was also displayed by the commanding officer and engineer of the separate air transport squadron. This was paid for with human lives.

Activeness, initiative, and zeal should be subordinated to an objective assessment of one's capabilities and the requirements of the appropriate documents. This is always important for any pilot. One must bear in mind that nobody is guaranteed against paying the price for ignoring this aviation axiom—neither the highest proficiency-rating pilot nor the test pilot. There is only one guarantee here—formulated for all authorities by N. Ye. Zhukovskiy.

[AVIATSIYA I KOSMONAVTIKA] In conclusion we should like to detail the role, significance and plans of the flight safety service, about the performance of which, for example, various opinions were expressed at an Air Forces conference held at the end of last October.

[Rusanov] Practical realities suggest a reply to this question. Since problems exist, professional approaches toward solving them should be implemented. Sometimes it is stated that command personnel themselves can assess the state of flight safety in the units under their command and take the necessary steps to improve it. This view is many times not borne out, however. In order to combat and prevent air mishaps, one must have thorough knowledge of them. How many air mishaps, for example, has an officer seen, investigated, personally experienced, and committed to memory "for the rest of his life" prior to being made a regimental commander? One or two.... This is naturally not much practical experience. But a flight safety service specialist is dealing with this constantly. He has statistics at his disposal from which one can derive a number of patterns and mechanisms. He is familiar with the weakest points in organization and direction of flight operations, in training of personnel, in the condition and status of equipment, and he possesses methods of localizing them.

But it is not only a matter of professional investigation of air mishaps and mishap-threatening situations. I am firmly convinced that flight safety service specialists alone can provide the most objective evaluation, free of interfering axe-to-grind elements, both as regards an individual air mishap and the overall state of flight safety in the unit. Incidentally, this is persuasively confirmed by the activities of counterpart agencies in civil aviation, in the various modes of transportation, and in other areas involving use of hazardous equipment.

[AVIATSIYA I KOSMONAVTIKA] And finally, on what elements do flight safety service specialist personnel propose to concentrate their efforts in the new training year which has just commenced?

[Rusanov] In contrast to the past emphasis on inspection, we shall concentrate our efforts on providing direct

assistance to Air Forces command authorities and flight safety service within the military districts in organizing and conducting practical measures to prevent those mishaps which are most typical for each air component or branch of military aviation, period of combat training, and specific features of a flight operations area.

Our plans include developing methods of air mishap prevention in aviation regiments, participation by flight safety service specialist personnel in training activities, improvement of information dissemination, and computerization of record keeping and analysis of air mishaps.

We shall be working on validation of flight safety forecasting, since evaluations of the type "the accident rate continues to be high" need more specificity. We shall endeavor to bring forth all circumstances and factors leading to emergency situations. Let us say, for example, that one engine failed on a twin-engine aircraft. The crew was unable to continue flying on one engine, as required by the emergency.... This in-flight emergency can be categorized as beyond the crew's control, rather than being attributable to deficiencies in crew proficiency. As a result the crew causes of the incident will be obscured in the final conclusions of the formal report on the in-flight emergency. Therefore the same thing could happen again. It would seem a good idea to prevent not only repetition of a specific air mishap but also of standard emergency situations, regardless of their basic cause (for example, broken down by flight phase, type of mission, etc).

We shall draw up variations of formulation of tasks pertaining to ensuring flight safety covering the period of a year (by type of tasks assigned to the other support services). These variations are specific for each level of structure within the Air Forces. This will make it possible to assess achieved results in a differentiated manner and at the same time to provide incentive for objectivity in determining and recording in-flight emergency situations.

I hope that all this will enable us, working in close cooperation with all Air Forces central directorates and services (particularly with combat training, the political directorate, aviation engineer service, armament service), to reinforce positive trends achieved in 1988 in the area of flight safety and to make a contribution toward further increasing Air Forces combat readiness.

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Defense Minister Addresses Komsomol Activists

91441174b Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 4

[Article, published under the heading "Implementing the Decisions of the 19th All-Union CPSU Conference": "The Times Demand Qualitative Changes"; Army Gen D. T. Yazov, USSR Minister of Defense, meets with Army and Navy Komsomol activists]

[Text] In the final phase of the training year a get-together was held between USSR Minister of Defense

Army Gen D. T. Yazov, candidate member of the CPSU Central Committee Politburo, and Komsomol activists from vanguard military units, including Air Forces units. In the course of a lively, serious discussion the young servicemen told how their Komsomol organizations are taking part in perestroika and in accomplishing the main tasks: maintaining a high degree of unit and subunit combat readiness, strengthening discipline and organization, and in increasing the cohesiveness of the multi-ethnic military units.

Army Gen D. T. Yazov addressed the assembled activists. "We are all products of Komsomol," he stated. "Each generation has made its contribution to the glorious annals of All-Union Komsomol. The current young generation has been given the great honor of being an active participant and builder of perestroika. The 19th All-Union CPSU Conference clearly defined the role and place of all Soviet young people in this most important process, including Armed Forces Komsomol—a vanguard youth detachment."

In this past training year many Komsomol members in the Armed Forces have achieved excellent results in increasing their combat skills, in improving their field, air, and naval combat proficiency. The ranks of excellent performers, proficiency-rated specialist personnel, and category-rated athletes have grown. Our young people are doing an effective job of mastering military equipment and weapons.

The Osen-88 [Autumn-88] exercise constituted for military members of Komsomol a tough test of combat proficiency. Conditions during the exercise approximated actual combat. Activities included executing marches across difficult terrain and engaging a strong "adversary." This required of the men a high level of military proficiency and physical fitness. And the majority of combined units and units displayed a high degree of combat readiness. Air Forces personnel successfully accomplished their assigned missions.

Such excellent morale on the part of Komsomol members is gratifying. It attests to the fact that many Komsomol organizations in the military are restructuring their activities in a spirit of the demands of the time and are focusing on the individual and on working with the individual. The process of mastering the skill of thinking and acting in the new manner, developing and deepening democracy within Komsomol, innovativeness and initiative, and making a determined break with stagnation and lip service is gathering momentum in our youth collectives. This is strengthening Komsomol's influence on all aspects of daily life and activities in our units and subunits.

In spite of many positive changes, however, Army Gen D. T. Yazov stressed, many problems remain both in the military organism as a whole and in Komsomol organizations. The main thing is that foot-dragging has not been fully eradicated. There is a persisting habit of total dependence on others, of waiting for instructions "from

higher up," and being carried away with form to the detriment of content. In some units words continue to be louder than deeds, with flourishing of actions geared to show and pretense, as well as fraud and deception. Such a state of affairs is intolerable.

In the new training year Armed Forces Komsomol must concentrate all its efforts on practical affairs. As we know, the crew-served nature of modern weapons and combat equipment and the conditions of their employment impose tough demands both on the individual skill of military personnel and on the teamwork and coordination of units and subunits. In order to become a genuine expert at one's job, it is essential to possess thorough knowledge of one's equipment and weapons and to use them in a skilled manner.

This is not simply a slogan or appeal. It is reality, confirmed in the crucible of the Great Patriotic War and once again put to the test during the rendering of internationalist assistance to the Republic of Afghanistan and at field exercises.

Komsomol organizations are called upon to do a great deal. They must actively work toward ensuring that military personnel achieve excellent results in combat and political training and be aware of the responsibility for study and effective utilization of weapons and combat equipment and for mastery of military knowledge. Competitions for the title of best crew, contests in combat proficiency among young officers and warrant officers, mentorship, exchange of know-how, etc can help here. The end goal of all efforts is excellent performance of assigned tasks and improvement in the level of proficiency of military personnel.

The USSR Minister of Defense emphasized that a special role in achieving qualitative improvement in the Armed Forces is played by military discipline. Today a high degree of organization and observance of regulations are an essential condition of perestroika. This is a demand of the CPSU Central Committee and a demand of the times. Proceeding from this, the main direction in the efforts of Komsomol organizations continues to be their joint activities with command personnel, political agencies, and party organizations pertaining to achieving strict observance of regulations. A specific task of Komsomol is achieving total eradication of interrelations which are at variance with regulations as well as all negative phenomena connected with them, and strengthening of friendship, comradeship, and mutual assistance. It can be accomplished if Komsomol committees and bureaus more seriously address matters of indoctrination and achieving cohesiveness of our multiethnic military units. We must not forget that the Soviet Army is international in both composition and spirit. It should become a genuine school of interethnic intercommunication.

Komsomol in the military should rely more on our fine fighting traditions in its indoctrinational work. There are many such traditions in every branch of the Armed

Forces. With skilled utilization they help develop in young people a correct understanding of military honor and dignity and mobilize youth for conscientious military labor and faithfulness to duty and the military oath of allegiance.

Concern with preparing young people for service in the ranks of the USSR Armed Forces is a vital concern of Komsomol. This task can also be successfully accomplished if each and every Komsomol organization in the military has solid ties with enterprises and educational institutions and preinduction-age youth become frequent visitors to military units.

"Carrying out difficult, bold tasks at critical, turning-point stages in our history," stated Army Gen D. T. Yazov in conclusion, "the party has invariably turned to Komsomol and young people, to their enthusiasm and devotion to socialism. Today as well, in the process of revolutionary renewal of society, as was emphasized at the 19th All-Union CPSU Conference, the party is placing great hopes on Lenin Komsomol."

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Hind Squadron Gets Through Afghanistan Tour Without Casualties

91441174c Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 5

[Article, published under the heading "Officer's Honor," by Hero of the Soviet Union Military Pilot 1st Class Gds Lt Col N. Malyshev: "Our Fighting Commander"]

[Text] The helicopter squadron was assigned the mission of reconnoitering a system of rebel weapon positions in the Osman Mountain area, 30 kilometers from Kandahar. And what does air reconnaissance mean in mountain terrain, where you could not spot even an entire division if it has taken cover? Somebody would have to deliberately draw fire. And the squadron commander did just this, himself leading a Mi-24 section.

What is so special about this? Other commanding officers have also time and again led their men into battle. A law of military aviation reads: Do as I do! This is true. But nevertheless....

The squadron commander was leading a section of young pilots. He had to make a lesson out of this mission, show them that combat is not simply willingness to take a risk but rather a contest between one's own skill and hostile fire.

How was the reconnaissance mission handled?

The section leader entered the rebel disposition area, and the Mujahideen opened fire. The reconnaissance helicopter maneuvered to avoid taking a hit, while his wingmen were pinpointing the enemy weapon positions. In addition, the squadron commander was responding to the enemy with fire in an unanticipated manner.

The pilots noted a sophisticated device used by the professional combat pilot: the commander was firing not at that position which presented the greatest danger to him from the standpoint of delivering fire, but instead fired at another, more distant position. This produced double the effect. He evaded fire from the closest weapon position with a maximum-rate turn, at the same time moving away from it, which enabled him to take aim leisurely and fire off an extended combination rocket salvo and burst of cannon fire at the far position without coming into effective weapons range.

As a result the section obtained full intelligence on the weapon positions, while the squadron commander destroyed two heavy-machinegun positions in the process of executing his decoy action.

On another occasion it seemed that the squadron commander proceeded contrary to all logic: he flew his helicopter, without stratagem, straight at a rebel gun position. After the mission the pilots asked him: "Why did you fly head-on at him?" He replied: "In the first place I was able to pinpoint the enemy position from quite some distance and take good aim. I was sure that I could put fire into the 'spooks' with a single run. In the second place, we appeared in the battle area with the element of surprise. The rebels had not yet had time to switch from ground to air targets. In the third place..., while we would be setting up clever maneuvers, the Mujahideen artillery would be slaughtering Afghan motorized riflemen without any hindrance." He went on: "Every engagement is unique in its own way. He who is first to grasp this uniqueness will emerge the victor."

There are many tough combat incidents in the squadron commander's military career. Two years in Afghanistan means two years of such experiences. But this happens to everybody who goes to war. For this reason as well Lt Col Anatoliy Vasilyevich Volkov, our squadron commander, is remembered by us not only for his courage and outstanding skill.

Once preparations were being made for a combat mission. Everything had been thought out, calculated, and rehearsed. We were refining the final coordination details. The plan devised by one of the pilots was not to the squadron commander's liking. It was then that he told us: "In combat a person is free to do as he chooses with his own life. That is his right. But when dealing with a comrade's life.... To be unable to provide cover or assistance—this should never happen. Every casualty is always on somebody's conscience."

This took us by surprise and probably for that reason was difficult for us to grasp. Anatoliy Vasilyevich noted our perplexity: "What? You do not agree? Then ponder this question: just what does war mean to a person involved in it?"

And we thought about the matter, at first as an obvious truth. But then suddenly each of us welled up with a great many thoughts! Several days later, following a large number of combat sorties (it was a busy time in the war

effort against the rebels), we returned to the discussion of war. We shared our personal discoveries. The commander again surprised us: "But it seems to me that war is first and foremost a great deal of labor. Unaccustomed, harsh, but nevertheless labor. Enormous, never-ending work. And protecting the lives of one's comrades is one of the main tasks. Both those comrades who accompany you aloft and those who are fighting on the ground and counting on your assistance. The fact is that tactics should be focused not only on maximum combat result but also on preventing casualties. If the plan as devised allows for casualties, this means that you are not ready for combat. So get back to work and look for new solutions."

Our "Volkov" squadron began to operate according to the rule: keep busy at all times. A very correct rule for living when at war.

We were performing important missions. Both we and others had moments fraught with danger. But there were no casualties, not one single casualty. Every last one of us returned home.

And today, when former "Volkov men," who have been scattered out over thousands of kilometers from one another, happen to meet, reminiscences begin, and the men are always unanimous in their view: our achievements, our decorations, and our return home without casualties are because of Anatoliy Vasilyevich. We lucked out with a commanding officer....

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Efforts Urged to Smooth Ethnic Frictions in Military

91441174d Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 6-7

[Article, published under the heading "Implementing the Decisions of the 19th All-Union CPSU Conference," by Maj Gen Avn V. Makeyev, chief of Propaganda and Agitation Department and deputy chief, Air Forces Political Directorate: "New Approaches to Internationalist Indoctrination"]

[Text] Our country recently celebrated an important date—the 66th anniversary of the Union of Soviet Socialist Republics, the world's first unified multiethnic worker-peasant union state. The Communist Party, headed by V. I. Lenin, was the inspiring force behind and organizer of establishment of the USSR, a country which was multiethnic in composition and profoundly internationalist in ideology and policy, organizational structure, and operating principles.

The world had never before known such a solid unity of interests and goals, such a spiritual and intellectual kinship, such trust and mutual effort on the part of dozens of nations and ethnic groups which, in a fraternal alliance, had become a powerful motive force of

progress. The solid military and political alliance of Soviet republics constituted one of the decisive factors in the victory of the world's first worker and peasant state over the forces of external and domestic counterrevolution during the years of the Civil War and the Great Patriotic War. Members of more than 100 nations and ethnic groups in our country fought for the Soviet homeland.

The indissoluble unity of brother republics today serves as a powerful factor in acceleration of the socioeconomic development of each republic and of the entire state as a whole and in increasing our country's defense capability. This is why it is essential, stressed M. S. Gorbachev at the 27th CPSU Congress, fiercely to protect the brotherhood and friendship of our peoples.

At the 19th All-Union CPSU Conference, proceeding from an analysis of the state of interethnic relations, the conclusion was reached that within this domain consistent implementation of a Leninist nationalities policy is the sole possible healthy basis for our country's development. During the period of cult of personality, however, and during the times of domination of an ideology of stagnation, its principles were violated and negative elements appeared, which were ignored and not appraised in a principled, party manner.

As we know, the Armed Forces are a part of society. Therefore weakening of attention toward matters of interethnic intercommunication and forgetting of Leninist principles were also manifested in a number of military units, including in the Air Forces.

There are presently several regions in our country where the nationalities question is in a rather critical state. Negative information and deliberately false rumors emanating from these regions exert a considerably negative effect on the human factor and the state of internationalist indoctrination of military personnel. These matters unquestionably demand the closest attention on the part of command and political personnel, party and Komsomol organizations of all Air Forces units and subunits, especially those stationed in the Baltic, Central Asia, and in Transcaucasia. In this regard we are entitled to expect not only attention toward the internationalist indoctrination of personnel but also the experience and know-how offered by new approaches toward accomplishing this indoctrination. Such experience has already been amassed in many units.

In the political section headed by party member V. Ulezko, for example, they have prepared and disseminated to the units a great many useful materials, surveys, and recommendations on problems of internationalist indoctrination and on gaining esprit de corps, cohesiveness and unity in multiethnic military units. These include the methods of holding 10-day events devoted to the union republics, under the slogan "In the family of free and equal republics," ethnic culture days, specific-topic evening activities, film festivals, and Leninist lectures on this topic. Recommendations to command

personnel, political workers, party and Komsomol organizations pertaining to gaining esprit de corps and cohesiveness in military units, eradicating relations contrary to regulations, strengthening discipline and rule of law merit attention. They are producing positive results.

Positive experience in conducting 10-day events entitled "In the family of free and equal republics" has been amassed in the unit in which P. Yevdokimenko serves as unit propaganda officer. Diversified forms of oral and visual agitation are utilized in the course of these activities, including political briefing sessions, specific-topic evenings entitled "May I introduce myself to the collective," oral magazines, discussions entitled "By a map of the republic," evening events honoring vanguard performers in socialist competition, and get-togethers with Air Force veterans, servicemen-internationalists [veterans of the war in Afghanistan], and the parents of Air Force personnel. Technical means of propaganda are employed both extensively and in a diversified manner: feature films and documentaries, taped letters and instructions from workforces and parents. Ethnic cuisine days are held, as well as other activities. The fact that the men eagerly take part in such 10-day events is inseparably linked with their increasingly activist attitude in combat training and in the sociopolitical affairs of the subunit and unit.

I should like to cite the example of the Air Force regiment technical maintenance unit in which Capt V. Orlovsev serves as party organization secretary. In this party collective they are successfully implementing the formula "one plus two," which calls for assigning an experienced, respected party member to conduct individual indoctrination work with two party-unaffiliated servicemen who are inclined toward violations of military discipline. And we must state that in this indoctrination work the party members are successfully establishing sincere and cordial contact with their young charges, are helping them gain a better mastery of the Russian language and their military job duties, are skillfully analyzing the motives behind the conduct of these individuals, study their character and personality, and maintain contact with these individuals' families and loved ones. I shall not discuss these comrades' work methods. I believe it would be better if the originators of this advanced know-how speak for themselves. I shall merely note that the experiment is producing good results. The unit is experiencing a stronger atmosphere of comradeship, mutual assistance, and respect for the men's ethnic worth. All this is having a positive effect on the combat readiness of the subunit and unit.

We could cite many other examples of thoughtful, purposeful activities on the part of command and political personnel, party and Komsomol organizations in the area of internationalist indoctrination and strengthening of military discipline. Nevertheless I should state that the level of this work is far from fully meeting the demands of the 27th CPSU Congress, the 19th All-Union Party Conference, and instructions by the Main

Political Directorate of the Soviet Army and Navy to the effect that military service should become a genuine school of internationalism.

In many units and subunits there has not yet been in this most important area the requisite perestroyka, renewal, and enrichment. The fact that in this past year more than one third of the known instances of relations contrary to regulations which have occurred in some units involved military personnel of different nationalities, including on an interethnic basis, is to a significant degree due precisely to this.

In analyzing the reasons for a poor level of effectiveness of internationalist indoctrination of Air Force personnel, one can pinpoint the following basic deficiencies. First of all, poor enthusiasm on the part of political agencies, command and political personnel, party and Komsomol organizations of units and subunits toward perestroyka and achievement of a decisive turning point in indoctrination of personnel, absence of a clear-cut, purposeful program of improvement of one's activities in this area, and slowness about carrying out practical measures.

In the second place, some commanders and political workers underestimate the actual situation in military units and fail to see the linkage between attitudes contrary to regulations, instances of mocking and abusive treatment, and interethnic relations. A rather strange position! Or consider the following. In the Air Force regiment in which officer I. Sadofyev serves, last year more than 50 percent of the total number of gross disciplinary infractions were committed by military personnel who are members of peoples of Transcaucasia, Central Asia, and the Baltic, who comprise only 9 percent of total military personnel. The conclusion would seem obvious: step up indoctrination work with these personnel. But in the unit in question they reached this conclusion only following a recommendation by the higher-echelon political agency.

It is evident from this that some commander-indoctrinators fail to show concern for studying the essence of the problem and for effective influence on the entire diversity of daily life and activities in military units.

In the third place, we should note the poor degree of methodological training and proficiency in forms and methods of internationalist indoctrination on the part of a substantial percentage of indoctrinators. The job is to teach them these skills. One can recommend the conduct of special seminars, training conferences, and training classes with various categories of supervisor personnel and activists, the subject matter of which would be focused on examining practical aspects of internationalist indoctrination. Considerable adjustments must also be made in the activities of agitation and propaganda groups and agitprop teams.

In the fourth place, in many subunits there continue to be violations of the principle of equal representation of military personnel of different nationalities on elected

party and Komsomol bodies and in volunteer organizations. Recently, for example, I visited an Air Force regiment in which military personnel of 22 different nationalities serve. I learned that, other than Russians, there was only one Latvian and one Turkmen among the large body of ideological activists. And yet it is precisely understanding by the individual of one's duty and responsibility to the collective that enriches and develops a serviceman, forms and shapes his social maturity. This axiomatic truth is not new, but unfortunately it is sometimes forgotten.

And, finally, I must state that some political agencies, party and Komsomol organizations fail to concern themselves with study of the Russian language by military personnel of non-Russian ethnic affiliation. The role of the Russian language as a language of professional communication and as a means of interethnic communication is inadequately shown. I believe that it is appropriate to mention the following lines from a poem by V. Mayakovsky: "...I would learn Russian only because Lenin spoke in this language." And yet there are many officers and warrant officers who have lived and served for many years on the territory of a union republic but do not possess even rudimentary knowledge of the language of that region.

Problems of Russian-ethnic bilingualism are taking on particular significance today and demand resolution. I can put it quite plainly: work connected with studying the Russian language and the national languages should be considered a matter of national and political importance.

In objectively appraising the state of affairs in Air Force units and subunits in the domain of internationalist indoctrination and cohesiveness of multiethnic military units, one must note that many party organizations are not doing enough in this area. The specific party guidelines contained in the proceedings of the 27th CPSU Congress, the 19th All-Union Party Conference, and a number of Central Committee decrees pertaining to interethnic relations have not become a guide to action for these party organizations. We must acknowledge the fact that in conditions where intensification of party work is taking place throughout the country and where the role of primary party organizations is being enhanced in all domains of our daily life, we have units in which party members have not yet become involved in ideological-political and internationalist indoctrination.

In view of the great importance of this issue and existing problems in resolving it, we cannot accept this state of affairs. The situation demands that political agencies, command and political personnel, party and Komsomol organizations take decisive, effective actions toward restructuring internationalist indoctrination of Air Force personnel and strengthening of the legal foundation of interethnic relations.

It is important today not to allow corrosive phenomena in interethnic relations which are encountered in some

parts of this country to carry over into our military units. To accomplish this it is essential first and foremost to know and carry out the requirements of the party, guideline documents of the USSR Minister of Defense and chief of the Main Political Directorate of the Soviet Army and Navy pertaining to this question. It is high time to eliminate a lip-service attitude, empty declaration, and administrative dictate and pressure from our work. I feel that it is necessary to hear regular reports from party member-supervisors on their role and place in the restructuring of indoctrination work in interethnic military units and to reflect in party character references and officer efficiency reports their ability to direct mutual relations in their subunits.

It is high time to improve the forms and methods of internationalist indoctrination on the basis of a thorough analysis of the processes and phenomena connected with changes in the ethnic structure of units and subunits, for even F. Engels advised never to ignore the specific features of the strong and weak points proceeding from specific ethnic features. Knowledge of the mood and attitude of individual military personnel, prevention of instances of unfairness and injury to ethnic feelings, selfishness and conceit arising on the basis of so-called common origin and, as a rule, engendering mutual relations contrary to regulations, is taking on particular importance.

It is useful to conduct regular sociological studies in the subunits, to synthesize and disseminate work experience in achieving cohesiveness within multiethnic military units and strengthening an atmosphere of genuine comradeship and mutual assistance in these units. Interethnic indoctrination should be linked with party principles of democratization of Soviet society and strengthening of the social, political, and spiritual unity between military personnel and working people. Strengthening of contacts between Air Force units and local party and Soviet agencies, enterprises, establishments and educational institutions can be helpful in this regard, as well as cultural-patronship ties between military units, workforces, and groups of creative artists.

Effective, well-proven forms and methods of internationalist indoctrination of military personnel should be used by commanders, political workers, party, Komsomol and ideological activists. They must study and be thoroughly familiar with the traditions and customs of those nations and ethnic groups members of which are serving in their unit. And, of course, that commander, political worker, and activist who is able to communicate with a subordinate in his native language will be a hundred times closer to that individual. A correct procedure is to concentrate attention on individual indoctrination and preventive efforts directly within the subunits.

It is important everywhere to step up dissemination of theoretical and practical aspects of Marxist-Leninist teaching on nations, ethnic interrelationships, and CPSU nationalities policy. It is essential to show by all means of ideological and mass-political work, using specific examples, historic achievements in resolving the nationalities question and the role of the brotherhood of peoples in the destinies of the union republics and the country as a whole. Emphasis should be placed on explaining the objective nature of the processes of internationalization of all domains of societal affairs and increased responsibility on the part of servicemen of all nationalities for strengthening discipline and guaranteeing the defense capability of the USSR. An important role in this is assigned to visual agitation and technical means of dissemination.

It is also advisable regularly to hold unified political education days and 10-day activities devoted to the union republics, get-togethers with veterans of the Great Patriotic War, veterans of the war in Afghanistan, question-and-answer evenings, literary and musical evenings, film festivals, and subscription campaigns for newspapers and magazines of the union and autonomous republics, oblasts and okrugs. Officers' clubs, unit club facilities, and libraries should make a contribution to this effort.

International friendship clubs have been operating for many years now in some units. This is a fine activity, and probably every Air Force base should have such a club. It can be accommodated in a single room. Its layout should reflect as fully as possible the multiethnic nature of our country and its Armed Forces. It should provide ethnic table games, files of newspapers and magazines in the languages of the peoples of the USSR, and small libraries containing the classics of Russian literature and the national literatures. I feel that such club facilities or rooms could become genuine centers for internationalist indoctrination of military personnel, while the entire effort as a whole could constitute a unique universal interethnic educational program.

The 19th All-Union Party Conference presented tough demands on defense organizational development, the effectiveness of which is henceforth to be secured predominantly by qualitative parameters both in regard to hardware, military science, and composition of the Armed Forces. Acceleration of the processes of perestroika, including in the domain of internationalist indoctrination of Air Force personnel, is a most important condition for this. Today is a time for action. And it is the task of commanders, political workers, party and Komsomol organizations to make a specific contribution to this effort.

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Discussion of More Democratic Command, Control, Management in Military

91441174e Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 8-9

[Article, published under the heading "Following a Policy of Perestroika," by Maj Gen Avn A. Bystrov, department chief, Air Forces Military Educational Institutions Directorate: "Democratization of Command and Control: Ways and Methods"]

[Text] ...The problems of renewal of society and moving people from a state of political apathy to innovation and initiative cannot be resolved by obsolete methods of force and methods of management by administrative fiat. There should be orderly procedure, however, and the law should prevail.

From a speech by M. S. Gorbachev at a get-together with officials of the mass media, ideological establishments, and unions of creative artists

As in all units, establishments, and military educational institutions of the USSR Armed Forces, the process of perestroika is becoming deeper and broader at Air Forces higher educational institutions. Enthusiastically supporting the party's policy of renewal of all domains of our lives, Air Force personnel are endeavoring by their deeds to achieve practical implementation of Central Committee guidelines pertaining to fundamental issues of perestroika, democratization, and improvement in the work style of supervisory personnel and party organizations.

The CPSU Central Committee has condemned rule by administrative fiat and pressure in management of the economy. Naturally in the Armed Forces administrative methods of management and orders are internally inherent attributes of the military organization, attributes which are indispensable. At the same time elements of governance by administrative fiat and emphasis solely on the force of command in conditions of our socialist armed forces never have been and cannot be predominant and adequate methods of direction and management. They should be supplemented by democratic forms of management, persuasion, and a high degree of consciousness on the part of personnel as well as an activist civic attitude and attitude toward one's job.

The author of this article, on the basis of amassed experience and analysis of new elements which have appeared in the course of perestroika in the work style of many commanders, political workers, Aviation Engineer Service supervisor personnel, party and Komsomol activists, presents a number of suggestions connected with the search for a way to improve methods of command and control of military units.

Command and control is a complex process which incorporates a great many kinds of activity by personnel.

The command and control mechanism can be represented in what to a certain degree is a simplified manner in the form of an integral set of three basic components: table of organization structure, method of command and control, and man as the main element in this system.

Unfortunately table of organization structure alone is frequently taken as the mechanism of control and management.

At the unit practical level there have been instances where attempts to achieve a radical improvement in things by means of improving command and control have led only to a change in the table of organization structure. In all else everything remained unchanged. I believe that the main reason for this lies in insufficient attention paid to the human factor. It was forgotten that command and control of military units is first and foremost control of personnel and, through them, control of weapons and military equipment, that is, to a certain degree this is a process of forming, governing and regulating human relations.

A protracted period of cult of personality and stagnation led to the forming of a method of management by administrative fiat and pressure [administrativno-nazhimnoy] or, as it is still sometimes called, komandno-administrativnyy [pertaining to management by administrative fiat] method of management, which led to rigid centralism as a mechanism of direction of society. Unfortunately many negative aspects of this method entered the military as well, frequently assuming the form of administrirovaniye [governance or rule by administrative fiat]. It found widespread application in the practical activities of many command personnel. It is not surprising that many people do not like this method of administrative management. The state of affairs is not changing, however. This is happening because there are as yet no other, effective management methods. Could it be that this method is not so bad in conditions of the military?

This method comprises essentially a pyramid of executing agents, in which man is assigned the role of "cog" both vertically and horizontally in the hierarchic structure of command and control. Commanders must think and make all decisions for all their subordinates as well. The daily life and activities of military personnel are governed and regulated down to the tiniest details not only by regulations, basic orders, and formal official instructions, but most of all by various directives, orders and instructions. As practical experience shows, the latter are so numerous that their demands frequently are in conflict not only with regulations but with one another as well. In connection with this the USSR Minister of Defense ordered in a recently-issued document that "a stop be put to issuing numerous orders and directives which duplicate existing regulations."

Blind adherence by officials to instructions from above frequently diverts personnel from conscientious observance of the requirements of regulations, basic manuals,

official instructions, basic orders and directives governing the daily life and activities of military units, operation and maintenance of arms and equipment. It cripples initiative, innovativeness, and independence in the performance of duty. Such a method of control and management "deforms" one's thinking, causes apathy, and sometimes engenders arrogance and swagger, conceit and deception, and the predominance of personal interests over the public interest.

Some command personnel, forgetting that one-man command presupposes first and foremost a high degree of responsibility for the assigned task and personal exemplariness, proceed to commit abuse of position and ignore ethical standards. Officers G. Pakilev, V. Barmin, and A. Lavrenchuk, for example, who recently held responsible positions, turned out to be beyond daily military and party control and oversight. They developed an attitude of immunity to normal rules and regulations and a timeserving attitude. Surrounding themselves with toadies and sycophants, they used their position for selfish purposes, influencing their subordinates to do likewise. In the final analysis they were punished most severely. Management by administrative fiat and pressure has a negative effect on the work style and methods of party and Komsomol organizations. As a result, instead of thorough analysis of work performance and determining the causes of errors by a given party or Komsomol member, and rendering of practical assistance to this person, we have rigid criticism and frequently harsh punishment.

This method produces feedback, focused on events which have already occurred, as a rule on gross violations of standards of conduct in the military unit. It does not enable one to see the incipient emergence of negative changes in the work performance and activities both of the unit and of individual personnel, does not enable one to take necessary preventive measures in a prompt and timely manner, and forces one constantly to be late in acting, after the fact, so to speak. This does not promote genuine movement forward in improving the quality of combat and political training, establishment of strict observance of regulations across the board, increased combat readiness on the part of subunits and units, and flight safety.

"Outright rule by administrative fiat, arrogance, conceit, rudeness, and all actions which diminish human dignity," noted Army Gen D. T. Yazov, USSR Minister of Defense and candidate member of the CPSU Central Committee Politburo, in an address entitled "Seventy Years Guarding Socialism and Peace" at an official meeting in Moscow, "are absolutely alien to our Armed Forces and not only have nothing in common with proper military procedure but are directly contrary to it, constituting an intolerable violation of the standards and requirements of regulations."

In drafting proposals pertaining to the new method of command, control and management, we have turned repeatedly to the experience amassed during the years of

the Great Patriotic War and the rendering of internationalist assistance to the Republic of Afghanistan. Combat brought forth commanders and political workers of initiative, with boldness and decisiveness, with the ability to lead others. Proximity to the men, knowledge of the factors motivating each individual, as well as prompt and timely help and assistance strengthened an indissoluble military friendship, in which there is no place for conceit, arrogance, or attitudes contrary to regulations. One-man command and democratic spirit were forged out as an integral whole in combat conditions.

I believe that precisely command and control in a democratic spirit would help accomplish with higher quality the difficult tasks assigned by the party to the Armed Forces at the present stage. We are not very accustomed to the term, but at some time we must move away from stereotypes which have outlived their time.

The new method of command, control and management will make it possible to develop initiative, boldness, and innovativeness in one's work. A new level of combat readiness, flight safety, and military discipline will ultimately be achieved. Just the former method, it is grounded on one-man command on a party foundation, personal responsibility for the assigned job, unswerving observance of the requirements of regulations, standing orders, manuals and instructions specifying the manner and procedure of operation and maintenance of equipment and weapons. The latter do not supplant the requirements of regulations. All other documents should be gradually withdrawn and rescinded. It is essential to empower command personnel and military units independently to carry out assigned tasks, and there should be as much one-man command as possible on a party foundation, and as much democracy as possible.

Presence within the scheme of command and control of a sensitive element formed by sociopsychological studies and practical support of the activities of military personnel constitutes the heart of this method and its radical difference from the existing method. Sociopsychological studies would be conducted on a regular basis, systematically, encompassing all military organizational components from the squad on up, from private to general. The purpose of such studies is to determine the factors which are hindering an individual from performing his job in conformity with regulations, from operating and maintaining equipment and weapons as required by the appropriate manuals and regulations, from performing assigned tasks in a precise manner, and from taking practical measures which would enable each and every individual to reveal his abilities.

Sensitive feedback associated with a command-control and management method will make it possible with a sufficient degree of probability to pinpoint deficiencies in a prompt and timely manner and to correct them when they are still at the early development stage. This method of control and management makes it possible to link one-man command with a democratic spirit and

glasnost, to exercise command and control in a firm and demanding manner, but correctly and properly, and constantly observing the mood of the masses. I believe that the work effort of party and Komsomol organizations will also become filled with new content and interesting activities, which will help eradicate lip-service attitude, predictable pattern and routine.

Sociopsychological studies should apparently be organized by the unit commanding officer and performed by political workers with the involvement of psychologists, sociologists, and psychophysicists.

One must also consider the following important factor: the new method presupposes strengthening of material and moral incentive to stimulate the activities of personnel. It is evidently high time to investigate the possibility of applying in the military economic methods of incentive by means of skillful utilization and economical expenditure of material and monetary resources.

Command and control in the new manner should form and shape command personnel and political workers who possess a higher level of professional expertise and greater theoretical and practical proficiency, as well as a good knowledge of economics.

An analysis of the state of affairs indicates that at Air Force higher educational institutions, following a certain amount of work, it will be possible in the near future to conduct regular sociopsychological studies of personnel. All the prerequisites exist for this. Schools have at their disposal skilled scientists and instructors in the social sciences departments, experienced political workers, and the specialist personnel of the cadet psychological aptitude screening (PPO) teams.

At a number of military educational institutions such teams are being successfully utilized to study personnel for the purpose of preventing gross violations of military discipline. At the Irkutsk Higher Military Aviation Engineering School, for example, where Maj Gen Avn B. Rozhkov serves as commanding officer, screening and placement of lower-echelon command personnel and Komsomol group organizers of the cadet subunits are done with sociopsychological studies and with the aid of the computer. Military discipline has been significantly improved here in 1987-1988, while accidents and criminal offenses have been totally eliminated.

At the Kharkov Higher Military Aviation School of Electronics (Col G. Radionov, school commanding officer) a psychological aptitude screening team consisting of Lt Col Yu. Mazhelis, Lt Col Med Serv A. Zheltyakov, and Soviet Army civilian employee research consultant psychologist Ye. Shevchenko extensively employs a method developed at the Psychoneurological Scientific Research Institute imeni V. M. Bekhterev. They regularly examine a large number of cadets, and on the basis of personality neuroticization and psychopathization levels (UNP) they can pinpoint that group of

cadets with inadequate neuroemotional stability, a so-called heightened-risk group. Requisite individual psychocorrectional and psychohygienic measures are performed with these latter.

Considerable work has also been performed by the PPO team at the Kharkov Higher Military Aviation Engineering School (Maj Gen Avn G. Yakunin, school commanding officer). Their experience indicates that it is necessary to integrate the efforts of political workers, departments of social sciences, PPO teams, and doctors. The studies proper should be conducted under the supervision of the political section chiefs at the military educational institutions. Only if this is done can one count on success.

In order to raise the Armed Forces to a new and qualitatively higher level, notes USSR Minister of Defense Army Gen D. T. Yazov, it is necessary first and foremost to improve the work style of military cadres. It is essential to eliminate all unnecessary limits and restrictions in the work activities of military collectives, to give them greater independence, and to indoctrinate personal responsibility on the part of one-man commanders for the assigned task.

The author does not expect total adoption of everything presented in this article. Transition from "pressure" methods of command, control and administration to democratic methods does not constitute replacement of labels on the mechanism of command, control, and management, but is a rather protracted dialectical process which involves change in people's psychology, adoption of specific techniques of studying public opinion, the moods and attitudes of military personnel, and strengthening of social justice. What is needed is joint search, reflection, and an endeavor to get out of the rut of old, established stereotypes.

Editor's Comment: In view of the current relevance and importance of the subject addressed by the author, the undisputed correctness of certain points, as well as the fact that some of the aspects of this issue are not treated fully enough in this article, the editors invite Air Force officers and general officers to take part in further study and discussion of this problem. Esteemed comrades: we await your letters, comments, and suggestions.

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Soviet Space Shuttle Expert Interviewed on Buran Flight

91441174f Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 89 (signed to press 5 Dec 88) pp 10-11

[Interview, published under the heading "On-the-Spot Report," with Col Gen A. Maksimov, USSR Ministry of Defense chief specialist on Space Shuttle Systems, by AVIATSIYA I KOSMONAVTIKA special correspondent Col V. Gorkov: "New Phase"]

[Text] On 15 November 1988 participants in and witnesses to the events at Baykonur once again became filled

with a sense of national pride, and not only because this was a man-made pilotless vehicle which had returned from space with jeweler precision, a historic first. This outstanding technical achievement will without question become the subject of discussion by the scientists of the entire world. But we should like to stress an important detail: the conditions in which the first tests were conducted.

It is difficult today to state who was the first to come up with the idea of naming the Soviet space shuttle Buran [Steppe or Plains Snowstorm, Blizzard]. And was that individual thinking about the fact that this craft would need to display its "character" during its very first test? In a very literal sense Buran tamed the gale winds which were raging across the Baykonur steppe.

A dreary autumn rain began in the evening on 14 November, and it seemed that the rain would never end. Judging from press reports, in such cases the Americans postpone their shuttle launches. What would we do?

Our readers will recall the events of 29 October. At T minus 51 seconds the automatic launch sequencer interrupted the launch sequence—the azimuth guidance system table had failed to withdraw from the launch vehicle at the scheduled time. And now the meteorologists were forecasting hail, snow, and gale-force winds. The State Commission found itself in a most difficult situation.

The journalists went out to the observation post at 1 a.m. The rain had ended, but a cold, piercing wind was blowing. Heavy, gray clouds drifted past, practically hugging the ground. Wind gusts reached 18 m/s. Incidentally, many people saw a wavering image of the rocket booster standing on the launch pad over the TV monitor. This was not caused by a cameraman with unsteady hand. The wind was rocking the mast on which the TV camera was mounted.

At 0600, coinciding with the first exact time signal transmitted by National Radio, a roiling shaft of flame illuminated the snow-grayed steppe. All operations were executed with precision by the launch vehicle and orbital craft, as if for the hundredth time. Nevertheless the anxiety remained. How would Buran stand up to the plasma layer? How would the automatic systems operate, and how would the shuttle vehicle handle the gale-force winds? Quite honestly, many thought that a human pilot is absolutely essential in such conditions. It was only after the shuttle craft "coolly" touched down on the runway surface that everybody became fully convinced of the great power of science and technology.

The following is an interview with Col Gen A. Maksimov, USSR Ministry of Defense chief expert on space shuttle systems and their future, by AVIATSIYA I KOSMONAVTIKA special correspondent Col V. Gorkov, after the landing of Buran.

[Gorkov] **Comrade Colonel General, on behalf of the journal's staff and readers I would like to congratulate you military specialists, everybody involved in the testing, on this great victory.**

[Maksimov] Thank you. This is truly a great victory. This time it was achieved through the efforts not only of that great team represented by the personnel of design offices, scientific research institutes, industrial plants, and military specialists, as they say. The foundations of this victory were laid by many years of labor on the part of the entire Soviet people.

[Gorkov] **Aleksandr Aleksandrovich, in your speech to the launch team at the end of October 1988, which was carried on television, you compared the launch of Buran with the launch of the first satellite. This statement evoked conflictive interpretations within journalist circles. Could you explain what you meant in greater detail?**

[Maksimov] I shall be more precise. I said that they can be compared in significance. In saying this I wanted to emphasize the importance of the first launch of the Energiya space shuttle system. In order to understand this, perhaps I should say a few words about the turning-point period in the space program which is presently commencing and about the role of Buran in this process. Tsiolkovskiy's prophetic words: "Mankind will not remain forever on Earth; in the pursuit of light and space man will initially probe timidly beyond the boundaries of the atmosphere, and subsequently will conquer all of circum-solar space...." are today closer to practical realization than ever before.

The development of productive forces has today reached a stage at which it has become possible to carry into space a number of energy-intensive technologies and environmentally-harmful production processes, as well as utilization of space for producing energy and for other promising technologies, and for control of air, maritime, and land transportation. On the other hand the traditional satellite services, such as communications, television, navigation, mineral exploration, weather reconnaissance, and others, today demand a new approach to their implementation. I am talking about infrastructure, effectiveness, and quality. In addition, man has learned to draw use and benefit from factors of space which are "harmful" to him—weightlessness and high vacuum. In this area the manufacture of unique pharmaceutical products and highly-pure crystals and materials for a new generation of electronics is the closest to realization on a commercial scale.

Accomplishment of the above-enumerated and other tasks is inseparably linked with the operation of reliable and efficient space shuttle systems and permanent space stations. Today these are stations such as Salyut and Mir, but in the future they will be large orbital structures with a highly-developed earth-to-space and space-to-earth transportation system. Extensive dynamic operations will also be conducted in the future in space proper.

Consider the mission flown by Leonid Kizim and Vladimir Solovyev aboard the Mir-Soyuz T-15 complex. Proceeding from the space station to Salyut 7, they picked up equipment weighing 400 kilograms and returned to Mir. In the future such flights will become routine, and technical servicing operations will involve flying a tour of inspection of a "chain" of satellites. This is why the direct launching of space vehicles into orbit, which is in common use today, will in time be replaced by a system of launch by stages, with more extensive utilization of intermediate "base" orbits, while orbital space stations and the "base" orbit proper will be utilized to an increasing degree as an Earth-adjacent trans-shipment base.

A new class of space hardware is presently emerging and will be evolving to an ever increasing degree: so-called transport and servicing vehicles, including orbital transfer vehicles, acceleration boost units, means of docking, transfer, servicing and repair of vehicles directly in space.

In May 1987, during a visit to the Baykonur space launch center, Mikhail Sergeyevich Gorbachev insightfully noted that the Energiya orbital launch system provides the preconditions for transitioning from quantity to quality. And this is indeed the case, for we identify this system with breakthrough to new technology, to a new space hardware infrastructure. This is why we are fully justified in linking its development with a second birth of the Soviet space program.

In conclusion I shall state that from the standpoint of a systems approach to the problem in question, it is essential to have large orbital space stations as bases plus a reliable "there-and-back" transportation system. We amassed a great deal of experience in designing and building space stations such as the Salyut and Mir, and we have proceeded with testing the Buran. The United States has been operating space shuttles for several years now, but it does not have an orbital space station at the present time.

[Gorkov] Our readers have been asking for quite some time for material about the space shuttle. This is impossible within the confines of an interview, and we are hoping to carry in our journal a separate article written by you. But for the present could you tell us the basic differences between the Buran and, for example, Columbia?

[Maksimov] At first glance the Buran and Columbia orbital vehicles are similar in many respects, just as are many aircraft. This impression is created by the similarity in outline and shape of the two vehicles. A first-glance assessment is frequently deceiving, however. Such is the case in this instance.

First of all, neither Columbia nor any other U.S. space shuttle craft can make an unmanned landing. Our shuttle vehicle's landing is fully automatic, right up to coming to a complete stop on the runway. This is a world first in accomplishing this task, and apparently in time the

principles applied will be adopted by aviation. Then fog and inclement weather will no longer be a hindrance to pilots and passengers.

In the second place, in our system the sustainer engines are not mounted on the shuttle vehicle but rather on the launch vehicle proper, which makes the system more versatile. Here too we have a second fundamental difference: the U.S. shuttle is powered into orbit by solid-fuel boosters and its own engines, while our liquid-fuel launch vehicle can lift into orbit any payload weighing up to 100 tons, with the Buran being only one particular payload. This is a very great advantage, and the United States is presently working on development of similar systems.

[Gorkov] Aleksandr Aleksandrovich, how long was the Energiya space shuttle system under development, and how does it compare with the U.S. Space Shuttle system?

[Maksimov] The United States spent approximately 10 years on development of the Space Shuttle system, while we spent two years more than that. What is the reason for this? I should like to remind your readers that the United States spent more than 25 billion dollars on the Apollo program, in the course of which an industrial and static testing base was established for the manufacture and fabrication of the large structures and motors of the Saturn 5 booster. Industrial facilities for the production of liquid nitrogen were established in the United States under this program. Experience was gained in operating with and handling liquid hydrogen, engines were developed, as well as static testing facilities for liquid-hydrogen rocket motors. All this experience and these facilities were extensively and fully utilized in development of the Space Shuttle system.

On the other hand, Soviet specialists had to build everything from the ground up, from the production shops, furnaces, and machine tools for large-size structural components to unique static testing and range testing facilities. This required additional time. In the course of these activities Soviet engineers designed and perfected on the basis of the most advanced technology a Soviet liquid-fuel rocket engine burning liquid hydrogen and oxygen. In its specifications and performance characteristics it is in no way inferior and in some aspects superior to the counterpart U.S. motor. In addition, we developed the world's most powerful liquid-fuel rocket engine with a thrust of approximately 750 tons, burning traditional fuel components, an engine which in its thermodynamic performance characteristics is far advanced in relation to the world standard in combustion engineering.

[Gorkov] What were the tasks being pursued by the test engineers in launching the Soviet space shuttle on 15 November 1988, and what about future flights?

[Maksimov] As already reported, this was the beginning of design and structural flight testing. Such testing involves checking out first of all the system component elements. A new, complex, unique experiment in space exploration has been carried out.

Let us begin with the ground equipment. The launch took place from a new, in comparison with previous facilities, standard automated launch complex possessing important distinctive features. It has three exhaust gas deflection channels instead of one. The gas dynamics are quite specific, with system-specific acoustic vibrations, different dynamics of mutual motion of launch vehicle and launch complex structural components. The preparation and servicing procedures of this launch complex are also different. All this was checked out and tested repeatedly during "dry" and "fueled" tests, but a final conclusion can be determined only following an actual launch.

The Energiya launch vehicle for the first time carried an aerodynamic orbital vehicle as payload and, in contrast to the preceding launch, the aerodynamic load was different, there were different component forces, and different distribution of stresses and dynamic oscillations. All this as well could only be tested in an actual launch.

And, finally, the shuttle itself—a highly unique automated unmanned space vehicle, equipped with dozens of systems and highly sophisticated electronics. Suffice it to say that the software employed by the shuttle's onboard digital computer system exceeds by a factor of four-five software developed in our country up to the present time for this type of application. Therefore for this launch full testing was not conducted on all systems, with only a partial test sequence, in order not to overload things. This is also the reason for limiting the flight to two orbits. Following thorough analysis of obtained results we can proceed on, to an unmanned mission lasting several days. As regards manned missions, according to the procedures adopted in the Soviet Union they can commence only after complete development and reliability testing of all systems in automatic mode.

[Gorkov] As we know, the Pentagon controls many of the Space Shuttle missions. What is the involvement of our military specialists in the Energiya space shuttle program?

[Maksimov] Soviet military specialists are taking part in preparation for and conduct of ground testing and launches of this system at the Baykonur space launch facility as members of composite crews, as well as in manning the tracking stations during orbital flight of the Buran shuttle craft. This is quite natural, since military personnel are more accustomed to living conditions in remote areas, and also the tests proper are hazardous to a certain degree. We, just as U.S. military specialists, naturally have an interest in a new, efficient space transport system capable of putting into orbit communications, navigation, TV broadcast, and weather observation satellites, as well as satellites monitoring compliance with international treaties. But the idea of "Star Wars" and turning space into a theater of military operations is fundamentally alien to us.

Our view of these matters is grounded on a profound conviction that development of large-scale international cooperation constitutes a constructive alternative to plans of extending the arms race into space.

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Self-Discipline, Sense of Responsibility Urged for Improving Flight Safety

91441174g Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 12-15

[Article, published under the heading "Flight Safety and the Human Factor," by Military Pilot 1st Class Maj Gen Avn A. Sidorov, first deputy chief, Air Forces Political Directorate: "Discipline Yourself"]

[Text] My every working day begins with the same question: what is the status of flight safety in the Air Forces? No, for me there is no problem of priority emphasis between combat readiness, proficiency, and safety. But first of all I determine everything connected not only with combat readiness but with safety as well. There are many reasons for this principle.

First of all, the current accident rate is the most objective indicator of our job performance. If a combat aircraft is lost in peacetime, such a situation so clearly illuminates the state of affairs in the unit that no performance evaluations or inspections are necessary.

In the second place, flight safety means people's lives. An air mishap or in-flight emergency is not only cause for an enormous effort to correct all the factors which led to the situation. An accident always in some way becomes irretrievably an element in the destiny of many individuals, and sometimes breaks them. Somebody has lost all prospects for career advance. Somebody experiences psychological trauma caused by the feeling that he is to blame for the tragic outcome of a flight, trauma which is permanent. Somebody becomes an orphan, and somebody ends up alone.... And somebody is no longer in line service.

One can go on and on enumerating the reasons why hundreds of commanders and political workers begin each new day with the same question. I mention two factors because the main thing lies concentrated within them: responsibility to the service, and human pain.

I stated the human after the service-related. It would seem quite clear that there is nothing more important than man. But as soon as analysis commences, the logic of the military professional imperceptibly takes over.

Do we really work in this manner? Do we rank man last? Unfortunately the answer to this question, which is so applicable to Air Force affairs, does not always gladden the heart. And then you ask yourself: "Why? Why? Why?"

Of course one can reply: aviation is aviation. In aviation you work at the edge of the possible, alongside danger, away from the ground. These factors are not a fiction or invention, but are everyday reality. Can we accept this? After all, we have very precise figures which confirm certain patterns of air mishaps.

The most sophisticated equipment possesses a quite specific degree of reliability, but not absolute reliability. We know that even the most highly-skilled operator makes mistakes. And a pilot is an operator who works in far from ideal conditions. And the experience of worldwide aviation indicates that objective air accident statistics exist. Why is it then that consciousness, ordinary human consciousness refuses to accept these arguments and finds reasons to reject the logical?

First of all, let us take the composition and quality of modern-day military aviation collectives. The many years which accrue from the first day at service school and one's first officer's shoulderboards are merely preparation for a professional career. Upon graduation from service school, young specialist personnel are assigned to highly-experienced units. One is always around seasoned, experienced mentors in aviation matters. One's entire service career takes place within the framework of a tested and proven system, in conditions of precise regimentation, where each and every operation has been validated, perfected, and prescribed. And there is double and triple oversight and verification!

Can all this be powerless in the face of impartial, from the standpoint of science, and cruel, from the standpoint of life, statistics? And every time I ponder to consider this contradiction. You cannot disavow statistics, nor can you simply accept them.

Just what does it mean to accept air accident statistics? It means to agree with the validity of standard (not total!) flight safety. Put in simple terms, however, this means that even prior to commencement of the first flight operations in a new training year we already accept that there will be so many air fatalities. People will die, people who today are among us, our friends, husbands, fathers, and sons. But when another year passes.... Will they no longer be here? "They will not!" declare the statistics. I personally cannot accept such a thesis as valid, regardless of how many precise and conclusive formulas back it up. And when theoretical deliberations lead to contradiction, only one thing remains—to turn to reality, to reality as you know it.

...A young pilot commenced practicing solo advanced aerobatic maneuvers. On the very first flight operations shift this lieutenant was scheduled to fly three advanced aerobatic maneuver sequences. Regulations did not prohibit this kind of work loading. The pilot went out once, and then a second time. But on his third time out he went into a spin during a roll and was forced to eject. The board of inquiry ascertained that on his first two flights he had committed gross errors during execution of this difficult maneuver. But the flight data recorder tapes

were not examined between flights, but merely given a cursory glance: no excessive G-load, he had not gone below minimum safe altitude, and airspeeds had stayed within allowable limits—so there was no problem.

This incident was filed away in the statistics as an example of pilot error. A great deal was left out of the statistics, however. For example, the fact that the lieutenant did not have a regular instructor. Various instructors had flown with him, instructors who, incidentally, later quietly shared among themselves the opinion that on each training flight the pilot had shown some rough spots in executing rolls. But only with this maneuver! Everything else he did well. And the pilot was allowed to solo without having fully mastered this aerobatic maneuver. Inspection of the flight data recorder tapes from the first two flights that day was also handled in a casual manner. It was done according to the following principle: "Hey, somebody, check the lieutenant's tape!" And "somebody" did. Cursorily and irresponsibly....

Why such a detailed discussion of this incident? There are two reasons.

The first is that statistics are incapable of taking into account the entire complexity of flight activities. Investigations as a rule show that some accidents "are prepared for" over the course of months, and sometimes even years. And it is extremely difficult to find the specific cause or source of the tragedy. And yet somebody was a constant witness to an incipient misfortune, and he could have stopped it, preventing tragedy.

The second reason is that many air mishaps could have very easily been prevented. Let us assume that somebody carefully examined the lieutenant's flight data recorder tape. If he had spent 10 seconds on the roll... 10 seconds—there would have been no in-flight emergency. There would have been no shattered career. 10 seconds of effort, and there would have been no addition to the statistics!

...Two squadrons are competing with one another in the unit. They are determined, ambitious rivals. The commander of the 2nd Squadron, who sent five maintenance technicians on leave at the same time, is short of aircraft. He comes up with an "ingenious" move: to fly specific-mission training sorties covering that area of training where a deficiency has been noted. The regimental commander had recently been chewed out over this training deficiency. "Now they won't turn me down. They will take several aircraft from the 1st Squadron for the entire flight operations shift," reasoned the commander of the 2nd Squadron.

This would not be such a bad thing if the idea had come to the flight training organizers prior to flight operations. And consequently there would have been thorough preparation of flight personnel. But the idea came and the decision reached maturity two hours prior to the end of preparations for flight operations.

A rough flight operations schedule was quickly drawn up. Quickly the pilots sketched out "comprehensive" preparation. They were quickly tested. All were ready!

Tragedy came the following day. A veteran pilot was killed while flying at low level. He had a great deal of practical experience in low level flight, but he had not flown nap-of-the-earth for almost two years.

Was this pilot error once again? According to statistics, it was. But what about actuality? The entire story involves an abnormal attitude toward flight operations, a poor moral-psychological climate in the unit, a lip-service attitude in competition, and much else.

Once again the searing thought: "But what if...." All that was needed was for somebody to display elementary honesty and integrity, to insist on adhering to flight regulations. Somebody to remind those who had temporarily lost their common sense. And there would have been no addition to the annals of Air Force fatalities.

Consciousness frequently rebels against statistics because frequently this exact science does not delve down to microbe level but records the already lethal outcome of a neglected disease. When you think about all this, a thought involuntarily comes to you: how much more immense is the cosmos of life than any and all theoretical constructs! But man's inner world is also a cosmic dimension....

The Commander in Chief of the Air Forces, in an article entitled "The Right to Make a Mistake" (AVIATSIYA I KOSMONAVTIKA, No 12, 1988), and military aviation personnel who spoke at a special conference on flight safety delineated a clear, precise position in regard to errors by flight personnel. There are standard errors which must be eradicated, so to speak, in the natural manner, by improving one's professional skill. But there are also other mistakes: violations! They should not be tolerated as a matter of principle. The entire Air Forces system is focused against them. They should have no way to get into combat aviation statistics. But violation-type mistakes continue, and it is only one step from such mistakes to major unpleasantness. How can they be eliminated? Answers to this question should probably be sought in a person's inner consciousness.

I remember when we were conversion-training over to supersonic aircraft. There were no dual trainers, flight simulators, or training facilities. Nobody had any experience. We conversion-trained on the basis of theory. Test pilots made demonstration flights. This was all we had with which to begin solo flying. No, we had something else—a strong, professional sense of caution, and the highest sense of personal responsibility, engendered by the former, and a sense of responsibility for everything, for one's own life, for one's high-performance aircraft, and for one's unit.

The first flights.... The unit chief engineer helped each pilot start his engine. The crew chief stood ready not merely to adjust a parachute strap, but stood ready to

give his very life for the pilot. The entire airbase saw a pilot off, and the entire airbase welcomed him back.

The pilot absorbed all this solicitude, concern, and solemnity. And somewhere deep in one's consciousness everything was transformed into responsibility, that responsibility which prohibits knowledge from being rough or approximate and forbids a cavalier attitude toward appraising one's own readiness to go up. Such a sense of responsibility is helpful.

We observed every takeoff and landing. We also flight-trained with the following method: consider watching 10 landings equivalent to making one yourself. We taught each other, and we learned from one another.

But this was not the way things were in all the regiments, and this was immediately apparent. Some very quickly advanced from their first takeoff to genuine expert-level proficiency. While others....

So should we return to those old days, which did such a good job of teaching responsibility? No, that is out of the question. It is unwise, illogical, and impossible. Scientific and technological advance have said their word and will not take it back. There is no road back to the old environment. And this means that there are no longer many of the automatically-operating factors involved in awakening a person's responsibility for the task at hand. But one's inner consciousness is not a volume of space unpenetrated by anything from the outside. Of course it is penetrated!

Nor are political workers denied the path into this realm, persons whose duty it is to introduce the embryo of qualities essential for today's combat aviation. Responsibility is the primary quality. But one must understand at the very outset that party-political work becomes a life-giving force only when it becomes the science of man, that is, when it acknowledges man to be the center of everything. Not an abstract unit of personnel which has been checked and adjusted in all parameters, but a unique, varying individual.

V. Sukhomlinskiy, an eminent modern educator, maintained that to educate means to understand. This has profound dialectical meaning. To understand! But we place a great deal of emphasis on another verb—"to bring influence to bear"! And we bring influence to bear....

We draw up all kinds of plans with an immense number of measures—solid, correct, tested and proven. But human psychology is not often encountered. Mar Avn A. Yefimov calls genuine commanders job aptitude scientists. In my opinion political workers are specialists in human psychology. They have a very difficult mission, but without focusing on human psychology, party-political work inevitably becomes overorganized, excessively formalistic and dry, failing to touch the men's hearts. And yet there is plenty of room for everything

there: harmful irresponsibility, and needed responsibility. But it is necessary to reach and make contact with the men's hearts.

This skill does not just come by itself. It is acquired by means of constant and continuous attention toward others, toward those who are uncomplicated and those who are complex, the reserved and the open, the cheerful and the morose, the good and the bad. And if personnel "do not respond" with good results (sense of responsibility, an aggressive spirit, honesty, diligence, courage) to all efforts by the political worker, then the latter must examine his own performance. And perhaps he should give up the commissar's job which he cannot handle. Yes, it is a complex issue, but that is only the half of it. There is a real problem when political work produces no effect of elevation of human qualities.

Unquestionably not only political workers should understand life and people. Everybody who commands, instructs, orders, evaluates, and prescribes must know, understand, and appreciate man. Is the flight surgeon's role a minor one? Does he have the right to treat the human heart as a biological pump? And is he entitled only to listen to the physiological rhythms of the system, to determine irregularity? Once again I recall....

Our regimental flight surgeon was a senior lieutenant of medical service, a young officer. But he did not measure his role by knowledge, profession, and quantity of time expended. He knew every single person. He was always there, in joy and in sorrow. He never begged off with any excuses when somebody needed help. Our doctor had the ability to assume any responsibility, both for an operation, if there was no time to wait for a specialist surgeon, and for treating children, when there was no time to ponder over the specific features of child therapy, when it was necessary to save a child's life.

For this reason his word was law for everybody, and not only in matters of medicine. If he advised somebody not to go up that day, nobody would try to argue that they were perfectly healthy. They knew that our doctor could sense us more deeply than could medical equipment. One could not count the number of unpleasant air incidents this doctor prevented. They could not be counted, because they never happened, thanks to him and his omnipresence.

Today Maj Gen Med Serv S. Bugrov is the chief of the Air Force Medical Service. Thus the strategy of human psychology is also warranted from the standpoint of career advancement.

Many factors affect combat readiness and flight safety. Why then do I place such emphasis on a personal sense of responsibility? Why do I link the forming of this quality with a sophisticated and difficult skill—cognition of man? Because personal responsibility is a strength or weakness of everybody who serves in the Air Forces. This is the court of last resort, the final filter in the "pilot-aircraft" system. Reliability of the system is determined by this filter: a clean, properly functioning

filter will pass only success and good fortune, a clogged filter will pass nothing, and a filter full of holes will pass everything, including misfortune.

...An aircrew departed on a weather reconnaissance flight. Cabin depressurization occurred, but the pilot continued the flight. The copilot had no oxygen mask. The navigator tried to give him an oxygen-feed hose, but he did not recover consciousness. The navigator also lost consciousness. But the captain (a detachment commander) continued climbing; subsequently he too became incapacitated. In short, a disaster, with only one surviving witness.

This is insane! How can it happen? But it happened. This incident shows that in modern aviation irresponsibility is tantamount to insanity.

But what orders or directives could prevent such an incident from happening? There are no omnipotent prohibitions or instructions other than a single force—a personal sense of responsibility. The regulations which govern flight operations represent an aggregate of algorithms which specify normal conditions of Air Forces functioning.

Combat readiness and flight safety are specific phenomena. They consist of a vast number of component elements. The human factor enters the end result not as a component but as a multiplier. Multiplication is a considerably more powerful operation than addition. For example, with responsibility (and this is the most important component of the human factor!) equal to zero, any labor will produce a zero result.

Let us ask ourselves the following question: can unpleasant air incidents be eradicated with the aid of the human factor? Or, more accurately put, is it possible to close the holes in flight safety which open up through the fault of personnel? I am convinced that it is possible. Of course such a state is an ideal. Reality will always differ from the desired ideal. But it is our common professional and party duty constantly and continuously to move closer to it. It is also our duty to Air Force personnel. In contrast to equipment performance characteristics, human qualities can be absolute. Strictly speaking, the fact is that human qualities do not happen to be absolute. Airspeeds, angles of attack, and load factors have operating envelopes. But honesty and responsibility either exist or do not.

As long as situations in which man's conscience slumbers, it is premature to consider the possibility of eliminating air mishaps caused by human error.

But there is one more intriguing element. If hazard and danger are removed from flying, will it not lose its attraction? Here is the way I see it. In peacetime there is no greater danger than to prove incompetent and unprepared to encounter a danger which may occur during flight due to circumstances totally independent of personnel. I know from my own experience and from the experience of my friends that a feeling of preparedness to

encounter the unforeseen and unpredictable generates a particularly proud sense of refusal to give in to circumstances and chance events. And this refusal to acknowledge the power of hopeless situations over oneself constitutes an important step along the road to confidence in victory over the adversary in battle.

The time preceding the spring of 1985 did a great deal to lull the restless human spirit to sleep, to draw it away from concrete deeds in the immense spaces of large-scale societal processes. Perestroika is turning us back toward ourselves. The party demands that we begin renewal with ourselves. And we are without question adopting this working principle. But when the matter in question is our daily routine, for some reason we seek unknown points of application of forces and gaze off in every direction, instead of looking at ourselves, calling upon ourselves to perform honest work, and giving ourselves the order: "I shall be responsible for everything!"

Without this internal command, all other orders are powerless.

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Difficulties of Flight Safety During Formation Flying Described

91441174h Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 14-15

[Article, published under the heading "Flight Safety: Experience, Analysis, Problems," by Lt Col Med Serv V. Kozlov, candidate of medical sciences: "Is It Easy to Fly Wingman?"]

[Text] I shall start with three examples from practical flight training. As he was maneuvering to attack a ground target, wingman Military Pilot 1st Class Capt L. Borisenko failed to hold formation and surged dangerously close to the element leader.... As he was exiting from a zoom climb, pilot cadet Yu. Popov lost sight of his element leader and approached dangerously close.... As he was searching for a ground target, wingman Military Pilot 2nd Class Sr Lt S. Somov became distracted and lost sight of his element leader....

As we see, these mistakes were made by pilots with differing level of professional skill. It is true that the response to these mishap-threatening situations was identical and traditional: disciplinary action, party discipline, temporary grounding of the pilots, subsequent taking of qualification tests, etc. But one typical feature is the fact that the disciplinary measures taken by the command element, regardless of their severity, failed to produce the desired result. Practicalities demonstrated once again that you cannot eliminate mistakes occurring in formation flying by punishing and giving moral "pep talks" to the personnel involved.

Analysis of such phenomena indicates that one of the reasons for this is one-sidedness in analysis of pilot

errors. As a rule main attention is devoted to the technical aspect of things, so to speak. And yet many times the psychophysiological mechanisms involved in the actions of pilots, especially wingmen, are not considered. We would like to discuss them in more detail.

As we know, in formation flying a wingman is performing two highly-motivated tasks: he is flying his aircraft and is maintaining specified formation parameters. And a third task is added in the case of combat sorties: attack of the target. Each of these tasks is performed with the active participation of consciousness. And yet the human operator remains a single-channel system, that is, when performing one task he inevitably is diverted from another. Therefore seeming simultaneous performance by a military pilot of all tasks connected with performing a training maneuver sequence is an illusion.

In actual fact he is constantly switching (at a very rapid rate) from one task to another. Only certain actions, which are performed automatically, so to speak, coincide in time. As we see, the tasks which a wingman encounters are in competing interrelationships. The more a pilot is diverted to one of them, the less time remains for the others.

How can formation flying be made safer? There are several ways. All involve forming specific skills and habits acquired through practice. The following are the principal skills in this group.

Flying the aircraft based on non-instrument signals, which include motor sensations, G-load, noise, vibration, etc. By using these sensations, vision is reserved for performing other tasks, primarily for maintaining formation parameters. In addition, controlling the aircraft on the basis of non-instrument signals is as a rule accomplished with minimum involvement of the consciousness.

The ability to predict the dynamics of the aircraft's position relative to the ground and the element leader by change in the value of a single flight parameter. Forming of this skill is based on a commonality of the information structures of flying and maintaining formation parameters. For example, after manipulating the controls the pilot, perceiving change in angular accelerations, load factor, or bank angle, can to a certain degree predict the dynamics of his spatial attitude relative to the ground and the element leader.

Flying on the leader. In this case the aircraft flying ahead is used as a source of information on parameters of formation and maneuver. This reduces to a minimum the time in which the wingman is diverted from observing the leader, which greatly increases flight safety.

Judging by all indications, greater attention should be devoted to these skills in the course of flight operations shifts, for it is no secret that during formation flying, for example, there are greater demands on precision of

maintaining flight configurations and formation parameters. A pilot who lacks experience in flying his aircraft on a leader will inevitably experience difficulties, since he will be forced to turn to his instruments more frequently. Two spatially separated visual sources of information are formed: the instruments and the lead aircraft. As a result excessive diversion to one of them threatens flight safety.

Another feature is no less important. Unfortunately instructors and command personnel frequently ignore this feature as well. When executing an aerobatic maneuver the wingman should execute the maneuver not only taking into account the performance characteristics of his own aircraft and the specified flight parameters, but also in conformity with the behavior dynamics of the lead aircraft. In other words he must constantly mentally predict the flight path of the lead aircraft and construct his own maneuver on this basis. Naturally such mental activities present certain difficulty to the inexperienced wingman and require thorough ground training.

During combat sorties, during organization of the attack, the wingman transitions to flying with predominant utilization of non-instrument signals and information proceeding from the element leader. Observation of the lead aircraft is accomplished with brief visual determinations not exceeding 1-2 seconds. The position of the aircraft flying out ahead is monitored considerably more frequently, which has a positive effect on observing safety procedures. Combat procedures conditions are also improved, since the pilot will not be diverted long from his weapon sight. The following condition should be observed in this situation, to be sure: the combat pilot must possess consummate mastery of his weapons aiming system. An optimal algorithm of actions performed during combat flying involves sequential monitoring of sight display and lead aircraft by means of brief visual determinations. The pilot should not attempt in these conditions to use his central vision to perform the mission and his peripheral vision to observe the lead aircraft.

External factors exert considerable influence on the actions of the wingman. Let us picture the following situation. A young pilot has mastered weapons delivery on a stationary ground target by a two-ship element, employing a specific maneuver. On the next training sortie he attacks with the same maneuver, but this time against a moving target.

It would seem that nothing has changed significantly. But such a factor as target mobility becomes a major obstacle to a wingman who has not been trained in attacking moving targets in single-aircraft sorties. He is hindered in performing the mission by the lack of practiced skill in placing and holding his pipper dot on a moving target return. Naturally he spends more time on the weapon sight, which in turn will lead to an increase in the discreteness of perception of the lead aircraft. This results in violation of formation flying safety procedures.

And here is what is typical. Analysis of such an incident will surely provide persuasive indication that the wingman's faulty actions were caused by the fact that he was not adequately trained in correctly distributing his attention. This of course will result in an increase in the number of weapons delivery training sorties in a two-ship element. And yet the desired result may not be obtained from such practice, inasmuch as the pilot needs to practice skills in weapons delivery on a moving ground target and in working with his weapons sight in a single-aircraft sortie.

In conclusion we should like to state the following. Increasing complexity of flight conditions differently affects the performance of the veteran and the inexperienced wingman. There exists, as it were, a pilot "threshold of sensitivity" to change in the conditions in which a mission is being performed. This threshold depends on level of proficiency. The more experienced a pilot is, the less his performance results depend on external conditions. This is an axiomatic maxim. As paradoxical as it may seem, however, it is frequently forgotten in the course of combat training during planning of flight operations shifts, and this leads to negative consequences.

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NATO Fighter Tactics Analyzed

91441174i Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 89 (signed to press 5 Dec 88) pp 18-19

[Article, published under the heading "Into the Military Airman's Arsenal," by Maj A. Fedorov: "Tactical Fighters In Combat"; based on the views of foreign military specialists]

[Text] NATO military experts, synthesizing the results of employment of tactical fighters in the U.S. aggressive war in Vietnam, in the wars in the Near East which the Israeli expansionists have waged, and in armed conflicts of recent years, reached the conclusion that one cannot count on success in operations by ground forces and naval forces without gaining air superiority in the tactical area of operations.

Military aviation experts are of the opinion that in present-day conditions it is possible to achieve such superiority, even in a small area and for a brief time, only by employing several modes simultaneously. A special role is assigned to destroying enemy aircraft in air-to-air combat. But the entire body of existing combat experience is critically examined and analyzed.

The NATO command authorities believe that air combat operations in the European theaters of military operations [NATO sectors] will be more intensive than in any past conflict by a factor of 6-8. The mobility of ground forces will also substantially increase, which will result in rapid change in the situation on the battlefield, at tactical and operational depth. A large number of

aircraft of various mission tasking will be concentrated in the air. Electronic warfare assets will be extensively employed. All this will greatly complicate command and control of individual aircrews and aircraft elements.

In comparison with local conflicts, aircraft losses will increase sharply in a complex air environment, with the adversary possessing strong zone and local air defense. Rapid replacement of aircraft losses will prove unrealistic, since many aircraft plants will be put out of commission, and long-distance redeployment of aircraft may be interdicted by enemy fighters. Therefore there arises in peacetime the need to maintain a sufficient number of tactical fighters in order to gain air superiority right at the outset in the initial phase of a war and to provide the requisite air support of ground and naval forces.

Gaining of air superiority would be accomplished, as in the past, not only in air-to-air combat and strikes on enemy airfields, but also by destroying air forces command and control systems and air defense assets. Nevertheless air-to-air combat is acknowledged to be the principal means of accomplishing this mission, since it is difficult to disable aircraft protected in reinforced concrete shelters.

Until recently all devised air-to-air tactics have boiled down to getting into an enemy aircraft's rear hemisphere, maneuvering into a position from which weapons can be employed (cannon or missiles), and taking all measures to prevent the adversary from maneuvering into a lethal position on one's own aircraft. This method was dictated by the performance capabilities of machinegun and cannon armament as well as IR-guidance air-to-air missiles. These tactics continue to retain their importance today when these weapon systems are employed. These tactics form the basis of maneuvering air-to-air combat.

The development of new weaponry (long-range all-aspect missiles, new guidance systems and methods, etc) provides capability to attack threat aircraft from a stand-off distance considerably beyond visual range, and virtually from any direction, including head-on or close to head-on. Today one can expect any aircraft to attack from any angle and from long range. And one must be ready and prepared to mount similar offensive actions.

Even with considerable technical capabilities, however, it is not always appropriate to kill enemy aircraft from long range. Close-in air-to-air combat is unavoidable when a missile misses due to effective defensive maneuver by the adversary, when the target has not been identified, when the enemy is jamming airborne radars, etc. Thus modern air-to-air combat can be long-range or close-in, and for this reason differing combat tactics are needed.

Close-range combat is fought with a visually-observed adversary. Such engagements vary in type and character, but in each one can identify the following phases: closing, positioning, attack, and breakaway. In this type

of engagement the initial tactical advantage goes to whoever first detects the threat aircraft. Rear-hemisphere closing and attack are considered the principal elements of close-in combat. During closing the pilot endeavors to reach the point of engagement undetected and to attack the target with the element of surprise. Closing proper is executed at a small angle and either from higher or lower altitude than the target.

Closing with subsequent weapons delivery head-on is done extremely rarely, due to the fact that there is insufficient time for accurate aiming.

Long-range combat would be fought by aircraft armed with high-power airborne radars and long-range Phoenix missiles. Long-range air-to-air combat is grounded on early detection and identification of threat aircraft. If these two conditions are met, air combat boils down to suitable positioning for launching missiles and effectively hitting the target at long range with a single weapons delivery.

Long-range air-to-air combat, however, involves a number of problems connected with identifying the target.

The following method of surmounting these difficulties is currently recommended. One of the aircraft flies a maximum-speed pass close to the target, visually identifies, and passes on additional information for selecting the most effective mode of attack. The other aircraft executes a fallback maneuver, and then maintains optimal range to the target, ready to launch. This tactic is effective, but it requires considerable expenditure of effort, eliminates the element of surprise, and increases the probability that one of the attacking aircraft will be hit. Fighters employ various formations to accomplish effective control and achieve maximum results against opposing aircraft. Depending on forward and lateral spacings, step-up and step-down between aircraft or elements, formations are subdivided into close formations (employed during those phases of a flight not involving performance of tactical missions) and loose formations. The latter in turn can be approach formations, used for executing a prior-planned tactical maneuver, and combat formations, used in air-to-air combat.

Western experts distinguish the following air combat formations: the two-ship element (the flight), and elements of various mission tasking. The two-ship element operates as a rule in an echelon or line-abreast formation, and less frequently in a formation in trail. The most typical formations for a flight-size element are the finger-four and the line-abreast or wall formation. Leaders, wingmen, and sections (flights) are designated in every combat maneuvering formation. The leader's mission is to attack, while the wingman's mission is to hold position in formation, to provide observation, warning, and support.

The tactical fighter squadron disposition consists as a rule of elements of various mission tasking, operating

according to a common plan, frequently without visual or radar contact with one another. The composition of each fighter element, its mission tasking and formation parameters are determined chiefly by the tactical mission. As a rule a squadron is divided into strike force and support elements. The support elements provide protective escort and cover, function as decoy strike force elements, and provide buildup of the strike force's efforts. A reserve is always designated, either launch-ready on-ground or in an airborne alert zone. Decoy-element aircraft may be positioned both forward of and to the rear of the strike force, at distances ensuring sure radar or visual range, 2000 to 6000 meters higher than the strike force. They are generally positioned ahead of the strike force when they carry pulse radars and hostile fighters can attack the decoy element only from the rear hemisphere. The strike-force or strike element leader maintains formation with the aid of radar and simultaneously conducts search. Upon detecting hostile fighters, he leads his element to the engagement point.

When aircraft are equipped with pulsed Doppler radar and when the strike force is under threat of forward-quarter intercept, the tactical formation is planned as follows: the decoy element is positioned to the rear and above the strike element. The enemy detects the decoys and reacts to them, while the strike-element fighters, unnoticed, attack the enemy with the element of surprise.

A tactical formation in flying close air support of ground troops contains a strike element and an escort element. The former should be equal or superior in numerical strength to the attacking enemy force, while the latter usually consists of a two-ship element (or a flight).

When escorting bombers, a direct escort element is designated along with a reserve element for buildup. The former fly in the formation with the escorted aircraft, positioned rearward within visual or radar range, 2000-4000 meters higher than the bombers. The reserve (combat patrol element) generally maneuvers in relation to the air situation and the probable direction of appearance of hostile aircraft.

Thus formations are extremely important elements of tactics. Analysts are unanimous in the view that the great diversity of forms and modes of conduct of air-to-air combat makes it impossible to provide the pilot with a precise basis of actions. Therefore study of combat begins with a simplified, mentally-constructed model.

In constructing this model, foreign authors arbitrarily divide combat into three phases: pre-engagement (detection of hostile aircraft and closing); engagement (combat maneuvering to a position favorable for weapons delivery); and final attack phase (attack, destruction of hostile aircraft or forcing it to turn tail).

The process of pre-engagement is viewed as follows. There is a certain optical or radar sphere of observation. If an aircraft enters this spherical volume of airspace it

will be detected. This may occur both during a fighter sweep action and during specific vectoring.

Four basic engagement situations are considered, depending on conditions of detection and mutual positioning.

The first is the forward-quarter engagement. The attacking aircraft detects the enemy at a distance exceeding maximum missile range. The defending aircraft as a rule detects the attacking aircraft in a timely manner. The result is a long-range missile engagement.

The second is engagement from a turn. The adversaries spot one another simultaneously within weapons range but in an "inconvenient" mutual positioning. There is intensive engaged maneuvering from the very outset.

A third variation is rear-quadrant pursuit with a high closing speed. This situation arises when the attacking aircraft approaches the adversary at a high approach angle and detection range is greater than the aircraft's weapons range. This can lead to a surprise, successful attack.

The fourth variation is pursuit with a slow closing speed. In this case the attacking aircraft closes the enemy on a pursuit path at a small approach angle. The initial position for firing weapons lies in the enemy aircraft's rear hemisphere. A sudden, successful attack is entirely possible.

The first two situations give the adversaries equal chances for attack. The third and fourth give advantages to the attacker.

In air-to-air combat it is important to consider the mutual positioning of opposing aircraft at each moment in order to determine the following: who is actually the attacker and who is the defender. Foreign experts employ two approximating criteria to make such a determination: he who first detects the enemy and consequently can engage or avoid engagement is considered the attacker; in the course of a combat engagement he who has the shortest path to reach a firing position or who is at the lesser angle of approach to the target becomes the attacker.

For the majority of modern fighters armed with cannon and short-range air-to-air missiles, the threat engagement range and position area is located in the threat aircraft's rear hemisphere. For this reason foreign specialists recommend use of a simplified rule for estimating the actual status of the engaged aircraft: he who is to the rear is the attacker, and he who is out in front is the defender.

During air-to-air combat every action by the attacker is countered by an action by the attacked aircraft, which boils down to evading attack or seizing the initiative. Admittedly it is very important to foresee the opponent's intentions and to choose a logically correct decision for continuing the engagement.

When the attacking aircraft has a positional advantage (is positioned in the adversary's rear hemisphere) and an advantage in speed, the defending aircraft can nullify these advantages both if he has a higher thrust-to-weight ratio or a superior energy level.

If the adversary failed to notice the attacking aircraft, the latter, if he is positioned in the rear hemisphere and is at a range permitting fire, will shoot him down.

When the adversary detects the presence of an attacking aircraft which has not yet employed its weapons, he has several defensive options: at high altitude and with a high thrust-to-weight ratio, he can violently execute tight climbing turns to prevent the adversary from delivering aimed fire (while not ceasing for a single second to endeavor to gain a positional advantage); at medium altitudes, in order to evade aimed fire it is expedient to employ a sustained tight climbing or descending turn; at low altitude a climbing roll executed with a high G-load is considered to be an effective defensive maneuver.

NATO experts have concluded that there is a need to develop aircraft optimized for air-to-air combat.

Foreign military theorists consider gaining air superiority to be a mandatory condition for successful combat operations by all branches of service and arms. Therefore it is planned to employ all combat assets and resources against the hostile air threat. But in the final analysis air-to-air combat is acknowledged to be the most aggressive form of gaining and holding air superiority. Not only scientific research but also air forces combat training in the NATO countries are structured in conformity with these views.

Our combat pilots must be prepared to respond to this both with persistent theoretical inquiry and a high degree of skill.

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Compressor Blade Failure Causes In-Flight Emergency

91441174j Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 20

[Article, published under the heading "Flight Safety: Emergency Situation," by Pilot Cadet S. Zgurets: "Measure of Self-Control"]

[Text] The silvery combat jet, rocking gently, taxied out onto the runway. The pilot, Gds Lt Yuriy Brazhnikov, meticulously completed his checklist. He called the tower: "293 ready for takeoff!"

"Roger. Cleared for takeoff. Departure route...."

The aircraft bathed the concrete surface with heat from its afterburners and, rapidly accelerating, proceeded down the runway on its takeoff roll, heading toward the clear, cloudless sky. The rectangular runway slabs flashed past under the aircraft. A few seconds later the

runway proceeded to recede rapidly as the aircraft lifted off. Brazhnikov was on his second training sortie of the day. He would be making a high-altitude stern-conversion intercept.

This officer had received a high mark on his first sortie. Naturally he wanted to receive just as high a mark on this intercept. The pilot's efficiency report read: "Extremely composed and alert."

He was still quite a distance from the "threat" aircraft. From time to time the tactical control officer would radio instructions to the fighter: "293! Turn to heading...."

"Roger, turning to heading...."

Brazhnikov adjusted his heading slightly to the right, his eyes riveted to the instruments, and his heart filled with the joy of flight. No, he had not dreamed of aviation from childhood, he had not dreamed of airplanes, and he had not built model aircraft. But his older brother Anatoliy had done enough of this for the two of them. Yuriy looked up to his as an authority, although their age difference was not very great.

When Anatoliy, while doing his compulsory military service, wrote him: "We are going to enroll in flight school," only then perhaps did Yuriy give serious thought to aviation. Two years later his brother returned home. They traveled together to the Armavir Higher Military Aviation School for Pilots. They passed their examinations. They were assigned to the same training squadron. Interestingly enough, they also experienced similar trials and ordeals.

Once Yuriy, who already had several solo flights under his belt, found himself in a difficult situation. Barely had his aircraft lifted off when he felt a sharp impact. It was later ascertained that a bird had been ingested into his engine. But at the moment there was no time to think about the matter. He had to make a decision within seconds. The student pilot successfully landed the aircraft.

Anatoliy was also put to the test, not long before the state examinations.

A foreign object had entered the turbine, pierced through the engine case, cut through a line, and ripped open a fuel tank. The aircraft blazed up like a match. Anatoliy had no choice but to eject. He kept his composure....

The brothers parted ways upon graduation. Anatoliy was sent to the Caucasus, and Yuriy was assigned to duty in the Ukraine.

Eleven others from the school were assigned to the regiment along with Yuriy. The lieutenants vied with one another to see who would be the first to be approved to fly solo.

Guards Lieutenant Brazhnikov emerged the winner. This won him a prize from the command element—a Polet wristwatch.

"293, target at 12 o'clock, range to target...." he heard the tactical control officer's voice.

A green blip appeared on his weapons radar—a return produced by the "threat" aircraft, which was not yet visually discernible. He picked up airspeed. "This is 293! Radar lock on target!"

A message lit up on his weapons sight: "Cleared to launch." Instructions came over his headphones: "Stand by, launch."

Brazhnikov flipped back the safety guard and pushed the black button on the control stick. This time smoky missile trails would not surge out from under the wing. Only a gun camera would record the target "kill."

The next instant something happened to the aircraft.

"This is 293! The throttle is shaking. My port engine is losing rpm."

"293! Douse afterburners. Commence descent...."

Now the entire aircraft was shaking, and it was getting steadily worse.

As soon as the aircraft began acting up, Brazhnikov cinched up the straps. They held him snugly against the seat. He might have to eject, but could he bail out before making every effort to save the aircraft? He resolved to hold out as long as possible. A fight began to save not only the aircraft but his own life as well. He had a single thought: "As long as it doesn't catch on fire. If there is no fire, I'll get the ship down."

Yes, he was confident of his ability. During the entire 14 minutes there was constant radio exchange between aircraft 293 and the ground controllers. Every word received from the ground had a supporting effect.

"This is 293! The entire aircraft is shaking," he reported.

"Shift to backup automatic system," the ground controller instructed.

"It's still shaking...."

At this point the alternator failed. A minute later a warning buzzer sounded: "Starboard engine oil pressure zero."

"293! Shut down starboard engine, continue descent."

The thought persisted: "Save the aircraft...." Sense of duty is a loyal assistant in any emergency. It helps overcome fear, control panic, and find the only possible solution out of a thousand possibilities....

But the situation was deteriorating. The alternator had failed, and his instruments were malfunctioning.

"This is 293. Starboard engine shut down."

"Run on your port engine.... You are on final approach. If anything happens, you are to eject."

"Roger."

"How is the control response?"

"Control no problem." "Commence final approach descent.... Extend landing gear...."

Even those who had not been informed of the emergency noticed that whitish smoke was trailing from the right side of the aircraft on final. But the combat jet touched down, and after a brief roll the two red-and-yellow drag chute canopies billowed out behind the aircraft. Soon the aircraft came to a halt. A puddle of kerosene began to spread on the runway surface.

Brazhnikov climbed out of the cockpit and moved away from the aircraft. Engineers and technicians arrived on the scene and proceeded to swarm around the plane.

They soon found the cause of the problem. A compressor blade had broken off. It was in large measure precisely in order to determine the cause of the engine failure that the young pilot worked so hard to save the aircraft, for an abandoned aircraft is an unsolved mystery which tomorrow may become an insidious trap snaring others. Thanks to prompt preventive steps taken by the ground maintenance people, this did not happen. On the instructions of the regimental deputy commander for aviation engineer service, special inspections were performed on all aircraft.

The following day Gds Lt Yuriy Brazhnikov was given a medical checkup. He was sent to the unit therapeutic rest facility to recover from the stress he had experienced. Before heading home he dropped into the technical maintenance unit, to take a look at his aircraft, which was now pretty well disassembled. Walking up to the aircraft, he said silently: "Don't worry, we'll be flying together again...."

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New Military Prep School In Latvian Capital

91441174k Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 21-23

[Article, published under the heading "Problems of Training and Indoctrination," by Lt Col N. Antonov, AVIATSIYA I KOSMONAVTIKA special correspondent: "Heading Toward the Military"]

[Text] Letters from readers led us to Riga, to a specialized boarding school with intensive study of the Russian language and intensive military and physical training. Although we had been provided with this information, it proved rather difficult to find the school. The fact is that the readers, making reference to certain newspapers and

magazines, called this boarding school an Air Forces special school, which is at variance both with its actual name and its function. Nevertheless I believe that we should report on this school.

Many passersby shrugged their shoulders in puzzlement at my question: "Can you direct me to the special boarding school?" Finally I lucked out. "That must be the school where the boys wear black uniforms with red ribbons," one woman replied and pointed the way.

We were standing at the edge of a small parade ground. Standing on the parade ground, gladdening the hearts of aviators, was an aircraft seemingly frozen in flight. Somewhat further on stood a group of young boys in formation, wearing a Suvorov school uniform. An officer was giving them drill instruction. Their smartness of bearing and appearance and the zeal with which the boys executed the commands indicated that they were enjoying the drill.

The entire countenance of the student officer of the day who greeted us at the building entrance also indicated satisfaction: both with his new uniform and his position. Speaking good Russian, but with a slight accent, he gave us directions to the school director's office.

The director's office was not much like your normal spartan general's office, although its occupant, Maj Gen (Res) V. Gromov, is from head to toe a military man. One's attention was drawn by the many books on military history, education science and psychology, various reference volumes, textbooks, and displays. There was some diving gear and various diagrams in one corner. A scythe blade was peeking out from behind a cabinet....

"I learn everything myself first," explained Viktor Grigoryevich, noting our puzzled looks. "When we received an aircraft which had been retired from service, I had to undergo a unique learning session in the cockpit, to learn the function of the various switches and instruments. And now I am thinking about trying on the diving suit, for the boys are very interested in everything, asking a great many questions, and one must be prepared to answer them. And how can one teach young people the virtues of work without displaying a good example? This is also why I am learning to handle a scythe and a mason's trowel."

The director told us that the special boarding school is in its second year of operation. It has a student body of approximately 240, and more than half of the students are members of the republic's indigenous nationality. The school enrolls boys who have completed 8 grades and have successfully passed a personal interview. The term of study is three years. During this time the students should acquire an adequate mastery of the Russian language, obtain solid knowledge in general subjects, become physically fit, and experience thorough internationalist indoctrination.

"All these seemingly simple matters in fact constitute substantial problems," said Viktor Grigoryevich. "Judge

for yourselves: how many, let us say, Latvians, Estonians, Kazakhs, Azeris, and young men of other nationalities are currently enrolled at Air Forces higher educational institutions? They are few in number. And their numbers are not increasing from year to year. One cannot give an unequivocal answer to the question of why this situation exists. But it is a fact, for example, that many Latvian boys, especially in rural localities, do not learn Russian or other subjects well in the years they attend a general-curriculum school. This unquestionably presents a major obstacle to enrollment in our country's higher educational institutions, including service schools. And yet there are many who would like to do so. I became convinced of this in my traveling about the republic, talking with 14- and 15-year-olds and their parents.

"The next problem is physical education of the younger generation. It is no secret that the majority of young soldiers have trouble handling physical workloads. During their military service the young men naturally become stronger and more physically fit, but the army too does not want wimps but rather healthy and strong young men.

"Sometimes a boy takes part in sports, spends hours at home flexing his muscles, pumps iron, but would never even consider carrying a pail of water or a sack of potatoes. And their parents are afraid that their little darling might strain something if he helped around the house.

"There are also many other problems connected with educating young people. I believe that the establishment of special boarding schools such as ours will help to resolve these problems in some measure."

One must agree with Major General (Res) Gromov. And both the special school's curriculum and routine convince one that it indeed can and should accomplish a great deal.

The school year here begins in a somewhat unique manner. After a personal interview covering the eight-year school curriculum, the young boys who are accepted to enrollment are put to another test—physical labor. At a summer sports, health and fitness camp on a kolkhoz, they work with shovel, saw, and hammer. The students themselves also do the maintenance and repairs on the building in which they live and study, the classrooms, sleeping quarters, and dining hall.

Classes commence on 1 September, just as at all schools. As already stated, special emphasis is placed on study of the Russian language and general subjects. A good job has also been done in selecting the faculty. Most of the teachers have taught for many years, possessing a great deal of teaching experience. As we know, this is particularly important at any boarding school. It is especially important here, for this school has certain special features.

First and foremost it is far from any militarization of the process of training and indoctrination. But the students wear a Suvorov school uniform and study the distinguished history of the Soviet Army, USSR Armed Forces regulations, weapons, and combat equipment. The boys become acquainted with many military occupational specialties. They are assisted in this by regular military officers. These include deputy director Gds Maj A. Travnikov, an Afghanistan veteran, Maj A. Shumilin, a former political worker and candidate master of sports, and Gds Capt A. Berbenko, a Suvorov school alumnus, who came to this special school on the recommendation of the party organization of a regiment with a distinguished combat history. The other officer faculty members are equally able.

We must say that they have their job cut out for them. It is one thing to train and indoctrinate soldiers and a quite another thing to work with adolescents. After all, we might as well admit it, sometimes it is difficult to handle a single boy at home, and there are more than 200 of them here.... And boys will be boys. They are characterized by restlessness, imagination, curiosity, and unbounded energy. And these are not always applied in a positive way....

During our interview with the director, a female teacher came to the office, with a complaint that her pupils had cut class. It seems that new overcoats had arrived for the students, and they were faced with the question of whether they should sit in class or sew shoulder boards on their overcoat. They chose the latter.

What a great deal of tact, restraint, and at the same time firmness must be possessed by each and every teacher! The director sets a good example. First and foremost one is astounded by his energy. It is no less than the boys' energy. But it is combined with the practical wisdom of years, excellent knowledge of education science and adolescent psychology, plus a clear picture of the goals and tasks of the school entrusted to his care. It is clearly apparent that Gromov enjoys a great deal of respect both from the students and the faculty. His instructions are carried out to the letter. In the course of the several hours we spent with him we saw that Viktor Grigoryevich has the ability to respect the opinion both of subordinates and students. He is inclined to give them greater independence, and he encourages initiative, inquiry, and stick-to-itiveness.

The special school's Komsomol organization, for example, is not under pressure by the director, but operates according to democratic principles. The Komsomol members have initiated many interesting activities: get-togethers with veterans of the Great Patriotic War, including pilots, field trips to service schools and military units, and Suvorov schools outside the republic. The boys are planning an excursion to Zvezdnyy Gorodok [cosmonaut training center] in the future.

The students of this special school have on several occasions visited the Riga Higher Military Aviation Engineering School imeni Yakov Alksnis. The Air Force cadets also enjoy visiting the boys and even serve tours of duty at the school as platoon leaders. They have found common ground with many of the boys: a love of the sky and aviation has helped. With the assistance of faculty and cadets from the Riga Higher Military Aviation Engineering School, the special school has set up study of specialized aviation subjects, as well as sport parachute jumping. Comrades Yu. Dozhnikov, L. Monakhov, L. Zhukovskiy, and others are helping out in these endeavors.

Forty eight special boarding school students have made jumps. Mikhail Badayan has made nine, and Armand Taube and Yuriy Khans have each made several jumps. Many of the boys are already looking forward to future enrollment at an Air Forces school. Almost one out of every three students has expressed the desire to get involved in flying club activities and is learning soaring and hang gliding....

At this point, however, the authority of the special school ends, and the little word "but" comes into the conversation. The question of providing training for the boys has not yet been settled with the flying club. The impeding forces of formal agreement, coordination, and excessive cautiousness are in operation. Nor are local Air Forces command authorities displaying much initiative. Very few people at Air Forces headquarters, for example, are even aware of the existence of this special school. Most of the initiative pertaining to various activities is coming from the boys themselves and from such flying enthusiasts as Aeroflot employee V. Ipatov. For this reason on the whole the aviation training of the special school students could be more substantial and enthusiasm for flying more serious.

And where are those military aviators who were talking so enthusiastically about the need to establish Air Forces special schools? Why is it that now they seem to be in no hurry to help the boys prepare a classroom training diagram, model, or training device or to hold a training class in specialized subjects and history of aviation? For how long will that veteran aircraft, which was in service with the Air Forces, remain simply a static display at the entrance to the school? After all, it could become an excellent training simulator and training aid, continuing its useful service, now on the ground instead of in the air.

Some of the people I talked with about this matter said that the lack of attention being paid to the special school is due to the fact that it is not operated by the Air Forces. But it is also not operated by the Navy, for example. This fact does not seem to bother the Navy, however, for the Navy people are showing definite interest in the school.

There is also another "but," which Major General (Res) Gromov mentioned. First of all, the school is not fully staffed with the specialist personnel it needs. Even during the difficult years of war and devastation such

schools taught art appreciation, art, and dancing class. These are no longer taught, and that is a pity. Viktor Grigoryevich is correct in stating that he needs a psychologist and a deputy for political affairs. The lack of a political worker is particularly undesirable. In these days of revolutionary restructuring, it is very important for young people correctly to understand events and to determine their place in these events. Experience indicates that ideological work does not tolerate stagnation. And if we fail to act, the director said, we lose initiative. As proof he introduced us to a student who had expressed the desire to become in time the first officer in a Latvian national army. There are also a good many other boys who are a bit mixed up. We also saw in the dormitory a windowpane which had been deliberately smashed with a rock thrown from the street. Such incidents may be isolated, and the fact is that an atmosphere of interethnic friendship prevails at the special school for the most part, but I feel that such incidents cannot help but be of concern not only to the school administration but also to the appropriate headquarters staffs and political agencies.

It would be desirable for the influence of Komsomol organizations, and particularly of Air Forces units and establishments, to be greater and more purposeful in this matter, which is so important at the present time.

And, finally, one more item which should not be ignored. There is no need to argue the correctness of the decision to establish such special schools. There is not enough information about them available, however, both at military and civilian agencies, establishments, and military units. This is perhaps explained in part by their passivity in giving assistance and in offering patronship. Many teenagers and their parents are not even aware of the existence of this school, let alone its curriculum and purpose, a fact of which Viktor Grigoryevich became convinced upon visiting various schools in the republic and talking with young teenagers. Unquestionably effective publicity is also needed for such an important undertaking.

"However," said Gromov, "the very name of our school—special boarding school—frightens off many teenagers and adults. The name is associated with special schools for mentally retarded or difficult teenagers. What is even worse, it causes some nationalistic elements to equate our school with special boarding schools for the children of persons subjected to repression which allegedly existed under Stalin. Why not call schools such as ours Suvarov schools?"

Indeed, as we see, a name is a matter of no small importance. One could even go further and give such schools the names of eminent Soviet military commanders and internationalist heroes, including Air Force heroes. It would also make sense to give some thought to what to call the boys. Official documents call them special school vospitanniki and uchashchiyesya [pupils, students], the school director calls them suvarovtsy [student at a Suvarov school], while the man on the street calls them "boys in black with red ribbons." What name will they end up with? I would hope that this question will be settled correctly. But the boys have already made their choice: they consider it an honor to have the right to call themselves suvarovtsy.

As it happened, we went to the special boarding school with the desire to report on how these boys prepare for military service, and particularly for service in military aviation, but we left chuck full of food for thought, so to speak. We would like not only to share what we learned and to draw the attention of young boys to special schools of this kind, but also to report on their current problems and unresolved issues. Nor is it any secret that soon Air Forces special schools will be opening up their doors to young boys. In establishing these schools it will likely be useful to consider both positive experience to date as well as existing problems.

This is a very necessary and important undertaking. It should not perish in empty talk. It should become reality, for it is precisely our young people, it was stressed at the 19th All-Union CPSU Conference, who will be fully deploying that vast economic, scientific-technical and intellectual potential which has been amassed during the years of Soviet rule, building upon and multiplying it many times over, and achieving the great goals of perestroika.

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Variations of Air-to-Air Combat Engagement

914411741 Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 89 (signed to press 5 Dec 88) pp 24-25

[Diagram: "Air-to-Air Combat: Engagement Variations"]

[Text]

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Key:

1. Process of Development of Air-to-Air Engagement
2. Detection range
3. Long-range missile engagement
4. Transition from long-range missile engagement to close-in air-to-air combat
5. Close-in air-to-air combat
6. Tactical dominant
7. Beating the adversary in delivery of effective fire
8. Effort to gain the initiative in close-in air-to-air combat
9. Maintaining the initiative in close-in air-to-air combat

10. Analyzed item
11. Forward-quarter
12. Rear-quadrant pursuit with high closing speed
13. Rear-quadrant pursuit with slow closing speed
14. Simultaneous detection
15. Graphic diagram of mutual position
16. Principal tactical objectives
17. Creation of conditions to launch missiles at maximum range: delivering weapons at a maximum number of targets; diminishing effectiveness of adversary's fire; prompt establishment of a reasonable formation; precise determination of moment of transition to close-in air-to-air combat.
18. Ensuring element of offensive surprise: prompt allocation of targets; preparedness to react to response actions by adversary; simultaneous attack on maximum number of targets.
19. Readiness to take preemptive actions if enemy aircraft proceed to split formation: taking initial position to deliver fire on maximum number of targets; efficient sequence of delivery of fire on elements of enemy formation.
20. Correct evaluation of one's own tactical status (who is the attacker?): efforts to seize and hold the initiative; evasion of threat of taking an immediate hit; aggressive offensive actions and intensive delivery of fire; uninterrupted, continuing teamwork during the entire combat engagement.

Improving Training of Aircraft Maintenance Personnel

91441174m Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 35

[Article, published under the heading "Advanced Know-How Put Into Practice by Aviation Engineer Service," by Detachment Commander Maj V. Shabald: "Striving for the Maximum"]

[Text] The airfield, resounding to the roar of service vehicle engines, was awakening after a cold winter night. The drivers were preparing the taxiways and runway for flight operations. The muffled noise of operating engines wafted from the airfield proper into the squadron engineer-technician personnel shack.

In the meantime an engineering-technical training class had begun in a classroom, organized not according to unoriginal routine pattern but taking into account new approaches and requirements. Contributing to the men's activist attitude was not only the fact that squadron deputy commander Maj S. Chirkov, who does a good job of handling things, was in attendance, but also by an objective analysis of the results of the most recent end-of-training-period performance evaluation. And the performance results were not uniformly high.

The majority of squadron personnel demonstrated a high degree of skill in the tactical air exercise which ended the training year. Aircraft took off on schedule, and equipment worked flawlessly. Personnel combat proficiency was rated excellent. Many officers, NCOs, and primary-rank enlisted personnel also displayed increased knowledge of theory.

It was ascertained, however, that there are some problems in the unit pertaining to the technical training of some of the men, especially the younger ones. While many officers, for example, replied with assurance to the inspecting officer's questions pertaining to theory, many

were unable skillfully to utilize their knowledge in a practical manner, such as quickly locating and correcting a malfunction. This applied in particular to Lts I. Volodin, S. Vyalts, and V. Kostin.

The engine on Lieutenant Volodin's aircraft gave a questionable reading during preparation for a sortie. Compressor rpm read low at one power setting. A simple malfunction which could be corrected with an adjusting screw. Instead of performing this simple procedure, however, the officer turned for assistance to servicing and maintenance group personnel. Departure was delayed while the latter assembled and conferred.

Similar helplessness was displayed at times by Sr Lts V. Sinkov and B. Lopatin, who on the whole were pretty well prepared from the standpoint of theory but were not always able to apply their knowledge in practice.

"What's the problem?" Maj S. Chirkov pondered. "Is it not because we study the equipment for the most part on the basis of manuals, diagrams, and models? Nor do the training facilities fully match the directional thrust of the training classes...."

Soon after the performance evaluation it was decided to hold technical training classes not in the classroom building but right at the field, in the aviation engineer service building, where the officers, after studying the requisite documents and training materials, would be able to reinforce their acquired knowledge directly on the aircraft equipment. This made it possible substantially to increase available training time, which in the past had been lost in part in traveling from the classroom building to the field. But the main thing was that now they were able to hone the maintenance specialists' skills and increase their technical knowledgeability.

This is why squadron deputy commander Maj S. Chirkov came to the field. He wanted to see for himself how things were going under the new procedures and, if necessary, to help the training instructor.

Incidentally, the squadron engineer did a fine job. First he explained to the men in an intelligent manner the physical essence of the processes taking place in the components of one of the aircraft systems. He repeatedly referred to the diagrams and a system model which had been spruced up by squadron handymen for the current training period. He asked the men questions on the topic, drawing them into a process of joint innovative inquiry.

Then, with the permission of his superior, the squadron engineer took his men out to the flight line and continued the training class. Working right on a combat aircraft, the officer described a "problem" to master proficiency-rated Capt V. Logvinenko. The officer quickly determined what component had "failed" and corrected the "malfunction." The other officers, including Volodin, Sinkov, and Lopatin, also displayed solid skills in working on the equipment.

The class was definitely beneficial. I believe this is connected with a conscientious, responsible attitude on the part of the men, as well as skillful organization of their training. New approaches to training were also a factor.

Restructuring of higher and secondary education in this country has advanced a number of urgent tasks pertaining to intensification of the training process in the military as well, including military aviation, where it is also inconceivable to achieve positive changes without innovative quest for new forms, advanced methods of presenting training materials, and practical reinforcement. The times demand improved quality of officer training. This task takes on particular importance in light of the guidelines of the 19th All-Union Party Conference pertaining to defense organizational development. Of foremost importance is the need to ensure effectiveness of subsequent Armed Forces organizational development by improving qualitative parameters. This means that everything which exerts a positive influence on the process of training of military cadres should be not only noted and evaluated but also utilized in an efficient manner.

It is precisely for this reason that from the very first days of the new training year there has been noted in the squadron a transition to training classes employing the principles of planned, orderly, step-by-step mastery of knowledge and skills, as well as more extensive utilization of training progression charts, memorization-aiding diagrams, and test instrument reference signal tables.

In the course of the training class the squadron deputy commander for aviation engineer service employed elements of the Shatalov method which, as we know, prescribes utilization of so-called basic outline notes and brief presentation of the study topic in the form of drawings, diagrams, graphs, and symbols presented in a logical sequence. Reference to the basic outline in the process of studying the material helps form in the men a clear concept of the essence of a given problem and

ensures effective memorization of the content of the presented materials with minimum expenditure of time and volitional effort.

An oral quiz of the men on the aircraft flight line confirmed that the topic had been fully assimilated.

Of course it is no simple matter to transition fully over to the new method. It requires that training instructors give up their accustomed stereotypes and that they exert additional effort on organizing training. We presently lack specialized presentational materials and methods guides. Therefore it is frequently necessary to proceed by trial and error, creating elementary training aids by common effort. But it is worth the effort. Most important, training classes become more effective, and the men's knowledge becomes appreciably greater. Also important is the fact that this approach frees up time to develop practical skills and accomplish other tasks connected with equipment servicing and maintenance.

Each of us realizes that an accelerated training method also presupposes a high degree of awareness, initiative, and independence of action on the part of the instructor. We therefore endeavor to turn more frequently to textbooks, reference and specialized literature, and to utilize the know-how of other innovators. Of course the new method will give us a great deal, but one can scarcely count on success if an individual does not display diligent effort in training and on the job, as well as a responsible attitude toward working on the equipment. We are working to develop these qualities in the men, supported by the party and Komsomol organizations. Nor are we abandoning such tried and proven but sometimes forgotten forms of training as mutual inspection of aircraft by competition rivals. We are endeavoring to conduct aircraft maintenance days in a more productive manner. In the course of these activities the men not only work on the aircraft but also study more thoroughly the aircraft's systems and components and hold training drills.

In the new training year the men of this subunit are filled with resolve to achieve excellent results. They say that a good beginning is half the job. I believe that the successful start in the subunit in which Maj S. Chirkov serves is providing an unambiguous answer: a correct course of action has been chosen. Quite frankly, we are counting heavily on an attitude geared toward maximum results, an innovative approach to training, and abandonment of obsolete stereotypes of thinking enabling us to boost the men's professional skills, reduce to zero in-flight emergencies through the fault of personnel, and honorably to maintain achieved performance levels.

Thumbnail History of Cosmos-Series Satellites

91441174n Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 38-39

[Article, published under the heading "The Space Program Serving Science and the Economy," by B. Pokrovskiy, Space Command, Control and Telemetry Complex Veterans Council chairman: "Space 'Plowmen'"]

[Text] Man has been studying and gaining knowledge of the earth for many thousands of years, the seas and oceans for several centuries, and has been conquering the air for about 100 years. All these domains are of limited dimensions, and therefore are comparatively accessible. Nevertheless there still remain a good many blank spots "on the land, in the heavens, and on the sea."

A little more than 30 years ago our country opened up for mankind the road to a new and, I emphasize, boundless natural environment—space. The rapid development of the Soviet space program during this historically negligible period of time and its achievements in the interests of science, technology, the economy, and culture are undisputed and acknowledged throughout the world. Nevertheless these are only first steps in the study and taming of the universe. The launching of each Kosmos raises us up to the next step on the endless road of cognition of the universe and the home of man—earth.

Space scientists and specialists will soon be celebrating a unique event: the launch of Kosmos [Cosmos] 2000 will fairly soon be upon us. And as always at such times, memory involuntarily turns back to history, to events of almost 30 years ago.

By March 1962 the space command, control and telemetry complex had already logged the launching of 16 space vehicles. The first difficulties and the first joys were now history. I would also like to say that today, thinking back over past experiences, one has a feeling of joy from awareness of the fact that our generation had the good fortune to be pioneers in the exploration of space. We felt like we were on the front lines of science and technology, and each of us was clearly aware that it is not only an honor but also a responsibility to be at the forefront.

I remember that our biggest bottleneck was the processing and transmission of telemetry from telemetry monitoring facilities to the central facilities. The principal data which had to be used immediately for purposes of satellite flight path control was processed manually at the KIK [space command, control and telemetry complex (system)] sites located hundreds and thousands of kilometers from Moscow. The result would be transmitted to the Center by telegraph or telephone. Unprocessed data tapes would be delivered by aircraft, and by train, car or truck in bad weather. The delays in delivery

of telemetry data which were inevitable in such instances were quite frustrating to the specialists, scientists, and engineers.

"Listen, when are we going to stop being dependent on God?!" Sergey Pavlovich Korolev once blurted out in irritation, his reference being to aircraft-grounding weather.

As we later realized, his concern was not only of the moment, so to speak. The chief designer was thinking about the future, and not the too distant future, when dozens of orbital vehicles of the most diverse scientific and applied tasking function would be operating simultaneously. This soon was brought home to us, when KIK received instructions to prepare for a new long-term program involving study of near-earth space, sun-earth interactions, as well as development and testing of new hardware in orbit.

The program was impressive in the extent and fundamental nature of the research to be conducted, the newness, diversity and enormous informational capabilities of satellite-borne scientific apparatus, as well as the number of launches involved. Twice as many launches of satellites of this series were to be performed in a two-year period as had been logged for all types over the last five years. To this would be added manned missions and flights by unmanned interplanetary probes and other space vehicles.

Calculations clearly showed that KIK would be unable to handle the flights of the Kosmos satellites with currently available facilities and equipment. We needed new space command, control and telemetry systems with considerably greater spacecraft traffic and data handling capacity. One such system was designed by a team of engineers under the direction of chief designer A. Mnatsakanyan, who subsequently was awarded a Lenin Prize and became a doctor of technical sciences and professor.

This equipment was so well conceived, designed, and reliably built that, after a few improvements, it faithfully served Kosmos satellites for more than two decades. And it was installed not in wooden shacks and truck trailers but in solid, masonry buildings specifically designed and constructed for this purpose. The construction of these buildings constituted a unique symbol of recognition of the correctness of location of telemetry monitoring facilities in this country. People ceased to consider their work at telemetry monitoring sites a temporary assignment; decent housing, stores, and schools were also built around these facilities. In short, the KIK telemetry monitoring sites began to assume the appearance of permanent settlements. Thus the Kosmos satellites had a positive influence not only on development of scientific and testing activities but also on personnel support facilities at the telemetry monitoring sites.

...Right on schedule KIK chief A. Karas and A. Mnatsakanyan, chief designer of the new ground electronics support facilities system, reported to the chairman of the State Commission for Launch of the First Kosmos and to

V. Voznyuk, who was in charge of the Kapustin Yar space launch facility, that the space command, control and telemetry complex was fully ready to commence operations. The commission's technical supervisor was V. Kovtunenkov, who is currently in charge of the Scientific Research Center imeni G. N. Babakin, where unmanned space probes are developed for investigating deep space, the planets and comets of the solar system.

On 16 March 1962 a two-stage launch vehicle designed at the design office of Academician M. Yangel lifted the first Kosmos satellite into orbit.

It is virtually impossible within the limits of a magazine article to relate all the research and experiments conducted over a period of more than 25 years employing the satellites of this series or even merely to enumerate them. I shall discuss only certain of what in my opinion are the most important, interesting results of the labors of these tireless "plowmen" of space.

These satellites helped scientists learn that space is not an empty, structureless expanse, as people previously thought, but a rather a unique, complex environment consisting of plasma and permeated with interlinked electric currents and magnetic fields. Study of the processes taking place in this environment and their relationship with solar activity, time of year and even time of day made it possible to obtain not only scientific but also important practical data.

For example, the data provided by Kosmos 7 helped select radiation-safe flight paths and flight time for Vostok 3 and 4, aboard which A. Nikolayev and P. Popovich flew the world's first multiple-vehicle space mission. Kosmos 4, 5, and 17 detected radiation from the nuclear explosion of the U.S. "Starfish." Incidentally, the disappearance of the residual radiation from this explosion was not recorded until seven years later, also by Kosmos satellites (261 and 262).

The Kosmos satellites also help the communications people. As we know, so-called ionospheric disturbances greatly affect the propagation of radio waves. Certain disturbances (diurnal and seasonal) occur on a regular basis, while others occur periodically, caused by powerful solar flares, for example. I would imagine that communications people of the older generation still remember how on 2 September 1967 radio communications worldwide were almost totally disrupted for a period of 2 hours. Scientists established that the cause of this was a massive solar flare. One must thoroughly study the whims of the capricious ionosphere in order to select those radio frequencies which provide reliable radio communications on earth and in space, including communications with the Kosmos satellites.

Radio wave propagation and the earth's biosphere are also affected by cosmic rays, which also present a hazard to cosmonauts. They enter the solar system from without, and their particles possess enormous energy which cannot be obtained on earth by the most powerful accelerators. They pass by our planet's orbital path at

speeds of from 300 to 800 km/s. It is difficult to conceive of such velocities: two to three million kilometers per hour on the average! It is equally difficult to conceive of their energy. If a particle with the mass of a rifle bullet were to strike the Black Sea, its energy would suffice to bring all the water in the sea to a boil.

Kosmos 261, 348, 381, 900, and many other satellites of this series were dedicated to study of cosmic rays, the ionosphere, magnetosphere, the earth's radiation belt, their interactions and effect on terrestrial life. The results of these studies are of great scientific and practical significance for radio communications, navigation, mineral exploration, and for resolving many other scientific and practical problems.

Kosmos satellites also conducted astronomical observations. One of the first to perform this task was Kosmos 215, which carried eight small telescopes. The need to lift telescopes beyond the limits of the atmosphere is dictated by the fact that the majority of astronomical objects emit most of their energy in the form of electromagnetic waves which cannot be detected by instruments even sited on the highest mountaintops, for these emissions are heavily absorbed by the earth's atmosphere.

Instrumentation carried aboard Kosmos 262, 264, 428, and others helped discover sources of X-ray bursts and helped to observe gamma bursts—those mysterious echoes of gigantic bursts of as yet undetermined origin, and helped discover traces of postulated emissions of intergalactic gas (in the opinion of some scientists this gas may represent the bulk of the matter in the universe). These and many other basic discoveries have led to reexamination of a number of notions about the solar system and the galaxy.

The Kosmos-series satellites have also made a substantial contribution to our knowledge of the effect of factors of space flight on biological objects: from single-celled algae, plants and plant seeds (Kosmos 92, 109, etc), to monkeys and other animals (Kosmos 110, 605, 690, 782, 936, 1283, 1887). And biomass was obtained for the first time aboard Kosmos 368. This experiment is of great importance for life support on future extended manned interplanetary missions.

The Kosmos satellites have also served as a unique scientific testing ground for development of equipment and for experiments which cannot be performed on earth. In this respect as well we should first and foremost note the brilliantly and fully-automatically accomplished dockings in orbit by two pairs of Kosmos satellites (186 and 188, 212 and 213) and the return to earth of recovery capsules from these satellites. The Igla automated radar search, approach and docking system, developed by a team under the direction of A. Mnatsakanyan, after certain improvements, has been operating dependably right up to the present day, handling the docking of supply craft with orbital space stations, including Mir, which is currently in orbit.

We should particularly stress the fact that practical international cooperation by the socialist countries in studying the universe began within the framework of the Kosmos program. Kosmos 261 was the pioneer. Subsequently Soviet scientists were joined by their colleagues from other countries, including France, Sweden, and the United States, in performing experiments aboard satellites of this series. And for the first time specialists from the European Space Agency took part in experiments aboard the Kosmos 1887 biosatellite together with scientists from the USSR, Hungary, GDR, Poland, Romania, Czechoslovakia, France, and the United States.

Kosmos satellites are also actively involved in the KOSPAS-SARSAT international search and rescue system to assist ships and aircraft in distress. This system has already helped rescue hundreds of persons from vessels in distress and downed aircraft in various parts of the world. Our Kosmos 1383 was the pioneer of this system.

Each satellite in this long series is normally launched by a separate launch vehicle. In a number of instances a single launch vehicle has boosted two (1100, 1101), three (38-40, 61-63, 1413-1415), five (71-75) and even eight satellites (336-343, 504-511, 1192-1199, 1287-1294) simultaneously. The operational life and life in orbit of the Kosmos-series satellites has also varied: from several hours to a million years. The cosmic field in which these tireless "plowmen" of science labor is also vast: Kosmos 1918 orbited at a distance of 131-265 km from the earth's surface, while the orbit of Kosmos 159 was at an altitude of 60,600 km. The inclination of satellites' orbital plane to the plane of the terrestrial equator has also varied from 0.1 to 98°.

The broad range of time and space in which the satellites of this series operate is due to an extraordinarily great diversity of research and experiments and the need to perform them in the most diverse regions of near-earth space, as well as above certain regions of our planet's landmasses and oceans.

Receiving great volumes of radio signals from the Kosmos satellites, telemetry monitoring stations on land, on the ocean and in the air relay them to those coordination-computer centers corresponding to the satellites' "work profile." There the radio signals are converted with the aid of high-speed general-purpose and specialized computers into numbers, letters, curves, and video images understandable to specialists. Data necessary for day-to-day mission control purposes are displayed with computer assist on electronic display boards and illuminated map displays which present a virtually real-time display of the current position of orbital vehicles above our planet.

...At the present time more than 100 operational Kosmos satellites are circling the earth. New, more sophisticated vehicles of this series are being mission-readied. Kosmos satellites are continuing to make a contribution to development of Soviet science and technology, economy and

culture, and to the cause of international cooperation in peaceful utilization of space.

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Mission Bad Luck of Cosmonaut Titov Related

91441174o Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 40-41

[Article, published under the heading "Stories About Cosmonauts," by V. Lyndin: "Tested by Bad Luck"]

[Text] The callsign "Okean" was heard above our planet for the first time in 1983. Vladimir Titov was looking forward so much to working aboard the space station! But fate ordained otherwise....

Vladimir Georgiyevich Titov was born on 1 January 1947 in the town of Sretensk, Chita Oblast. He completed 11-year secondary school in this town. School came easy to him, and the door to higher education seemed open. Vladimir dreamed of a career as a military pilot, but his mother wanted her son to become an engineer. It was necessary to reach a compromise: the final choice was the radio engineering faculty at the Kiev Civil Aviation Engineers Institute. He received a mark of four on all five entrance exams and failed to make it in the competitive selection process—he was one point short. He was out of luck.

But Volodya did not despair. Returning to the Transbaikalian, he took employment as a furnaceman for an oil exploration outfit. He did not waste his time idly: he studied for the flight school examinations and also prepared his mother for this next step. And the following year he enrolled at the Chernigov Higher Military Aviation School for Pilots imeni Lenin Komsomol.

He flew with enthusiasm, honing his flying technique. Notice was taken of this able cadet, and upon his graduation in 1970 he was made an instructor at the school. In four years Vladimir graduated 12 student pilots. He was subsequently transferred to a duty assignment in the Air Forces Unit imeni V. Seregin as a flight commander. In 1976 V. Titov was assigned to the Cosmonaut Training Center imeni Yu. A. Gagarin.

What kind of flying ability did he have when he arrived at the Training Center? His comrades noted that Titov flew with boldness and confidence, gained his bearings rapidly and made intelligent decisions in a difficult situation. He had logged 1300 hours in various aircraft. He had flown Mikoyan and Sukhoi high-speed fighters, as well as the Yak-40 and Tu-134 passenger aircraft. During his flying career Titov had earned type ratings in 10 different aircraft. He particularly likes group jumps, when during free fall the skydivers would form intricate patterns, approaching and moving away from one another, and delaying opening their canopy until they are very close to the ground. Such jumps are a part of the general cosmonaut training program. The Cosmonaut

Training Center instructors use such jumps as a training device for operating under actual stress conditions. This is an excellent way to learn to make decisions when time is critically of the essence.

Just like all the newcomers at the Cosmonaut Training Center imeni Yu. A. Gagarin, Vladimir first took the general training course. He also studied theoretical subjects, such as dynamics of flight, space vehicle control systems, space navigation, etc. Having successfully passed his examinations, as a member of a cosmonaut group he proceeded to study specific space hardware. At the time this included the Soyuz spacecraft and the Salyut 6 space station.

In September 1981 Vladimir Titov and Gennadiy Strekalov began training for an extended mission aboard the new Salyut 7 space station, which had not yet been put into orbit. They were the backups for primary crew No 1—Anatoliy Berezovoy and Valentin Lebedev. Titov was first introduced to reporters in this capacity. By tradition they hold press conferences at the Cosmonaut Training Center imeni Yu. A. Gagarin just before crews depart for the space launch center. Vladimir's "space" last name immediately attracted general attention. It is highly likely that everybody recalled our second cosmonaut, G. Titov. But Vladimir hastened to clarify the matter: "I am in no way related to German Stepanovich."

Vladimir Titov, Gennadiy Strekalov, and Aleksandr Serebrov were to be primary crew No 2 to man the Salyut 7 station. They were launched on 20 April 1983 aboard the Soyuz T-8. This was the second space mission for Strekalov and Serebrov, but it was Titov's first.

The launch into orbit was nominal all the way. The spacecraft separated from the last stage of the launch vehicle, and the cosmonauts proceeded to check out the onboard systems. On the second revolution they began checking out the Igla—the electronic approach and docking system. But the Igla system dish antenna position monitoring display failed to light up. Telemetry analysis performed at Mission Control confirmed that the antenna had failed to deploy properly. Attempts were made to move the assembly by creating acceleration forces with brief engine burns, but without result....

The book calls for canceling the docking procedure in such a situation, since the cosmonauts lack the range and speed measurements required to execute a docking approach automatically or manually. Nevertheless an attempt was made to execute these maneuvers, through joint efforts by the ground support services and the spacecraft crew.

Crews of Soyuz T spacecraft were able to calculate by computer the required space station docking approach maneuvers on the basis of the position vector determined from the ground. The crews of V. Dzhanibekov and L. Kizim had demonstrated that manual control of the docking approach maneuver is possible from as far out as 5000 meters. The situation was much more complicated for Titov and his comrades. Their craft was

not equipped with special range and approach speed measuring equipment. The cosmonauts would have to do it on their own, coordinating their actions with Mission Control.

...Two luminous dots—the spacecraft and the space station—crept slowly across the big map of the world in the main room at Mission Control.

"'Oceans,' give us a one meter per second burn," instructed the mission controller.

The cosmonauts attitude-aligned their craft and fired up the engine. Mission Control talked them along. Another burn....

The spacecraft and orbital station entered the earth's shadow, losing communications, when they had closed to 280 meters. It is very difficult visually to estimate range and speed in the darkness of night in space. The space station's position lights were approaching rapidly. There was a danger of collision. At this point Titov fired up the propulsion motor to thrust the spacecraft downward. They passed under the space station and lost sight of it. When they emerged from the shadow they spotted Salyut 7 about 3 or 4 kilometers away....

Primary crew No 2—Vladimir Lyakhov and Aleksandr Aleksandrov—manned the Salyut 7 space station in their place. Four months later Vladimir Titov and Gennadiy Strekalov were again launched into orbit, to relieve the space station crew.

"When we were preparing for this mission," recalls Titov, "Strekalov said: combat veterans say that a projectile never hits the same crater twice in succession."

This time the "hit" was different.

It happened at 2337 hours on 26 September 1983. The final commands in the launch countdown sequence were being given. The umbilical was about to be disconnected and withdrawn. Suddenly a flame appeared at the base of the rocket. At first it was assumed that the engines had fired. But soon there was a feeling that something was wrong. The flame appeared down below, near the engines, but somewhat to the side, and it immediately shot upward, twisting around the launch vehicle....

"We were waiting for liftoff," Vladimir Georgiyevich later related, "and suddenly there was a surge of vibration. I thought that it was a wind gust of maybe 20 meters per second. This was followed by a second wave of vibrations, and then suddenly a powerful jerk. We were pushed into our seats. It was the emergency escape system motors firing. They fired for 4 seconds. From this point everything proceeded nominally. Nose fairing release, payload module separation, and parachute system deployment. We landed about 4 kilometers from the launch pad. The reentry module touched ground bottom first. We looked at one another and remained silent. Through the left viewport we could see the launch pad engulfed in flames.... Bad luck again! We heard Leonid Kizim's voice in our headsets: 'Don't worry,

fellows, no problem. They'll be right there to help you exit from the capsule.... Don't worry, you'll fly another day."

It was then that somebody hastened to proclaim that V. Titov was jinxed. But he stubbornly continued training for future missions. He graduated from the Military Air Academy imeni Yu. A. Gagarin as a correspondence student.

...In January 1987 Aleksey Leonov, deputy chief of the Cosmonaut Training Center, introduced to reporters the Mir Space Station primary crew No 2 and its backup crew. The primary crew consisted of Vladimir Titov and Aleksandr Serebrov, while Yuriy Romanenko and Aleksandr Laveykin were the backup crew. However... Titov had bad luck once again. They were already at the space launch facility, just a few days before launch, when the doctors grounded the mission flight engineer. Serebrov was subsequently "reinstated," to be sure. He returned to the ranks of active cosmonauts and was named to the backup crews for the Soviet-Bulgarian and Soviet-French missions. But that was later. On this occasion Romanenko and Laveykin were the ones who flew the mission.

Three attempts, three times a member of the primary crew—and three times a failure. Many would have given up at this point, but Vladimir Titov persisted.

At 14 hours 18 minutes 03 seconds on 21 December 1987 a launch vehicle carrying the Soyuz TM-4 as payload lifted off the launch pad and soon disappeared in a gray veil of low clouds. The blinding flame of the rocket engines rapidly faded and continued glimmering through the cloud cover for a short time only as a dim, fading spot of light.

Once again the callsign "Okean" sounded above the planet. Vladimir Titov and Musa Manarov were headed toward the Mir space station to relieve the current station crew, Yuriy Romanenko and Aleksandr Aleksandrov. Anatoliy Levchenko was the third crewmember aboard the Soyuz TM-4.

The space mission flown by Vladimir Titov and Musa Manarov lasted exactly a year—366 days (it was a leap year). A special article will deal with their mission aboard the Mir station. We shall merely note that upon completion of the joint Soviet-French mission V. Titov, M. Manarov, and Jean-Louis Chretienne returned to earth, while A. Volkov, S. Krikalev, and V. Polyakov remained in orbit.

The Mir orbital station is called a permanent space station for good reason. This means that there is to be a permanent crew presence aboard. Vladimir Titov returned from this orbital mission with a sense of duty accomplished. The ordeal of bad luck was finally over.

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Hasty Flight Planning, Negligent Procedures Result in Fuel Exhaustion

91441174p Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 42

[Article, published under the heading "This Could Have Been Avoided," by Candidate of Technical Sciences Lt Col Ye. Kondratyev and Lt Col P. Karpenko: "They Were in a Hurry to Take Off...."]

[Text] The aircrew under the command of Military Pilot 1st Class Lt Col N. Kukharev had successfully completed an extra training sortie and was headed home. The crew members were in high spirits, with no foretoken of an impending emergency. The flight was almost over. The crew chief's [flight technician's] report that there was not enough fuel remaining to make it back to their home base took everybody completely by surprise. They immediately requested clearance to proceed to an alternate field.

They were cleared to divert. Things were not too good at the alternate. Limited visibility and low air temperature.... The engines gave out between the outer and middle compass locator, one a few seconds after the other. The crew performed calmly and without panic in these extreme conditions. They succeeded in bringing the ship down in one piece. The aircraft came to a halt only 18 meters short of a sheer dropoff. It was essentially these meters which separated the crew from disaster.

A board of inquiry was duly formed to investigate the incident. Attempting to take the blame off the crew, Lt Col N. Kukharev stated that the emergency occurred due to a malfunction of the aircraft's fuel system during the last 90 minutes of the flight, which led to fuel exhaustion, as a result of which the engines shut down.

In the course of a detailed, thorough examination of the circumstances which had led to the forced landing, the board of inquiry established that equipment failure was not at fault. The causes of the emergency situation had been laid down long before departure: mission preparation of the crew had been organized hastily and poorly, and the engineer and navigator calculations had been performed superficially, as a result of which the aircraft had not been fully fueled. Another element involved was the fact that the crew was flying an aircraft other than their regular one. For this reason none of the crew was aware that it carried less fuel-economical engines. In addition, in the general haste the flight technician had made a 1.2 ton error in setting the fuel flow readings.

An airspeed en route which exceeded the flight-plan airspeed by 40-50 km/h was another factor contributing to the forced landing. The increased engine power setting resulted in increased fuel consumption. The aircraft commander, Lt Col N. Kukharev, and his navigator should have considered this factor, should have refined their calculations of fuel requirements to their alternate and, if there was insufficient fuel remaining, they should

have requested another alternate in advance. The pilot failed to do this, however, although he could have.

There was another contributing factor: throughout the entire flight the crew members failed to notify the pilot of actual fuel remaining in a prompt and timely manner. Thus they contributed to the fact that he made the wrong decision in choosing an alternate airfield.

Thus haste in preparing for the training mission, poor knowledge of the peculiarities of the aircraft operated by that unit, as well as violation of procedures by the crew members led to this in-flight emergency.

In this unit serious conclusions were drawn from the incident. Classes were conducted to study the specific features and peculiarities of the aircraft being flown by the unit. The crew's errors were analyzed in great detail, and appropriate preventive measures were taken. The aircraft, which has been repaired and returned to service, is being operated with no problems.

We had a reason for relating this incident. The point would seem to be rather elementary: every crew member should be given the necessary time for specific psychological preparation for a specific flight—to become composed, to concentrate one's attention, to think through the flight plan and sequence of procedures, to switch on, as it were, that system of skills and abilities which ensures flawless performance of all required operations in a specific sequence. But apparently some people have not yet adequately assimilated this.

Haste, carelessness, or failure to observe the rules and regulations which specify flight procedures inevitably lead to an emergency situation. It was only chance and "elements of luck" which helped Lt Col N. Kukharev's crew avoid serious consequences from a forced landing.

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U.S. Research on Shielding Electronics Against EMP

91441174q Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press 5 Dec 88) p 43

[Article, published under the heading "Abroad," by V. Kaloshin, Candidate of Technical Sciences: "Dangerous Preparations"; based on materials in the foreign press]

[Text] In the middle of last year the world learned about new Pentagon schemes. Over the course of several days foreign news service reports contained the name of a U.S. Navy auxiliary vessel, the "Empress." On this specially-equipped barge they were planning to conduct experiments to test the capability of equipment to withstand the effect of the electromagnetic pulse (EMP) caused by a nuclear burst.

U.S. military strategists believe that if there is a major military conflict, prior to employing his principal offensive weapons the enemy will detonate a 10-50 megaton nuclear device at an altitude of 400 km above the earth's

surface, in order to disable air defense and ballistic missile defense radars. Unless protected and shielded, all electronic and electrical devices located within a radius of approximately 3,000 kilometers will be disabled. It is hardly likely that damage to vitally important systems can be repaired within the limited time required for a retaliatory strike. And the more complex a piece of electronic equipment, the more vulnerable it is to EMP.

For decades now U.S. scientists have been investigating the effect of EMP on solid-state electronics. Particular importance is being attached to these research activities today in connection with the fact that the United States is endeavoring to improve the quality of its principal weapon systems by utilizing complex electronic equipment developed on the basis of microelectronics. The physics of occurrence of EMP and its effect on aircraft and their electronic gear has been established.

When a high-altitude nuclear burst occurs, EMP is generated chiefly as a result of knocking electrons out of air molecules under the effect of gamma radiation. These electrons, accelerating in the earth's magnetic field, become emissions sources, generating powerful EMP. It reaches a maximum after 5 nanoseconds, and the damaging effect ceases entirely after 10^{-6} seconds. In spite of the fact that the pulse proper is of brief duration, some electronic devices can sustain irreversible damage.

Experts estimate that a nuclear explosion in space generates an electromagnetic pulse which is propagated hundreds of kilometers, affecting power transmission lines, communications links, ground radars, and vehicles.

In view of the physical nature of EMP, one can assume that induced currents from EMP will first and foremost affect integrated circuits with a supply voltage of 5 volts, and consequently the electronic equipment in which these ICs are located. In connection with this, new requirements are being specified for future components: ICs should be resistant to radiation and to EMP.

The effect of EMP on satellites and ground-based systems proves to be more substantial when there is interaction between the gamma radiation generated during a nuclear burst and the surfaces of the affected systems. This leads to the forming of free electrons within the systems and to the emission of an internal EMP generated by the system itself.

According to reports in the foreign press, the United States is taking steps to shield the electronics of principal weapon systems against EMP. Several testing devices are used at the Air Force Armament Test Lab, for example, to study the effect of EMP on electronic equipment, recording devices, and electrical wiring of aircraft, guided missiles and transport vehicles: dipoles with vertical and horizontal polarization, the Alex calibrated electromagnetic signals system, and a Trestle unit.

The purpose of the testing is to find weak links in aircraft and various systems. Individual system components are

tested to accomplish this end: transistors, replaceable modules, and recording devices.

According to the estimate of foreign specialists, the U.S. Air Force plans the production and delivery by mid-1989 of 100 B-1B bombers shielded against the effects of a nuclear burst. Air Force Armament Test Lab engineers are assisting the aircraft developers in the conduct of tests of the effect of EMP on the B-1B.

There is also a major program to provide shielding of other combat aircraft against EMP. An F-16 fighter, for example, was tested over a period of 4 months in conditions of simulated nuclear burst EMP. The aircraft was subjected to the effects of 3100 EMP; 1,200 test points were chosen to record the reaction of onboard electronic gear to these effects.

Over the course of a five-year period combat equipment, including the B-52 aircraft, were tested on the Trestle EMP simulator. Although the results of these tests are classified, experts acknowledge that the effect of electromagnetic pulse from a nuclear burst can be substantial. It is reported that EMP does not result in the total destruction of equipment but can disable digital circuits and electrical remote control systems.

Several means of protection have been developed in order to meet requirements pertaining to equipment resistance to the effect of EMP: shielding, [zapredelnyy] waveguide, spark-gap arrester, a system of filters, varistor, fiber optics communications link, and high-speed stabilatron.

The United States is conducting full-scale research on shielding individual microchips and utilizing special protective devices which provide filtering and protect critical microelectronics against EMP. It is noted that the Air Force Armament Test Lab has substantially increased the survivability of electronic systems by using protection methods.

In view of development trends in microelectronics (decreasing integrated circuit supply voltage to several volts) and airframes (employment of composite materials), one can assume that the effectiveness of efforts to protect electronics against the effects of EMP will increase in the future.

This "defensive" thrust in research, however, as well as statements to the effect that experiments will be conducted under the strictest oversight, are not very convincing. Military preparations by the Pentagon, which has placed the latest advances in science and technology at its disposal, arouse legitimate concern on the part of the world community.

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Helicopter Regiment Vanguard Technical Maintenance Unit

91441174r Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 44-45

[Article, published under the heading "Problems of Development of Young Officers," by Lt Col V. Bezborodov: "Generosity Is Repaid a Hundredfold"]

[Text] Helicopter regiment technical maintenance unit chief Gds Maj I. Repetiy, as customary, was touring his busy "domain." Ivan Vasilyevich received reports on work in progress, asked brief, to-the-point questions, and received terse, precise replies from his men. There was no sign of either nervousness or haste. Each and every maintenance specialist knew his "maneuver" and performed it with skill and assurance.

At higher headquarters I was told that I. Repetiy has achieved success in training maintenance specialist personnel and that one can learn a lot from him. I wanted to learn his secret.

"There is no secret," replied Ivan Vasilyevich. "I must admit that at one time I had to do a good deal of thinking on the matter, and still do now. The entire secret lies in a correct understanding and distribution of responsibility. What is a commander responsible for? Both for the operational reliability of the equipment and for the political state, morale and discipline of personnel.... In short, for everything involving the unit. Nevertheless the most important thing is concern for the fate, even the happiness, if you will, of one's men. Unfortunately not all supervisors realize that it is precisely this which in the final analysis determines a subunit's success or failure. But some commanders at various echelons will fail to mention and will fail to recall precisely this particular duty and obligation. Why is this? I have never heard about any superior being punished for the fact that a subordinate 'was stuck' in a job assignment and was considered unpromising for career advancement. Nor have I ever heard about anyone being commended for educating and developing a worthy successor."

Ivan Vasilyevich is right. We only go around once, but many people act as if they have several more lives to live and will be able to rectify things, rewrite their biography anew, crumpling up a ruined sheet of paper and taking a fresh one. We entertain a powerful illusion that we can do tomorrow that which we have failed to do today. Perhaps we can, but only at the expense of tomorrow's work! Hours, days, and years pass in this manner.... And all those around a person reconcile themselves with the fact that he is ruining his life. He didn't finish his work? He didn't accomplish the job? He didn't finish training his men? He didn't think things through to the end? Well, what can be learned from this young officer? Repetiy is equally demanding on everybody. His reasoning is as follows: one should not consider that a person is only a lieutenant but that he is already a lieutenant! It is simply by virtue of his youth that he is

unable to see what he is capable of achieving. And it is the commander's job to boost an individual, to strengthen his faith in his own ability.

"However," Ivan Vasilyevich went on, "failure is inevitable if a commander assumes the full burden of education and indoctrination of his men. When I can find the time, I reread the writings of noted Soviet educator Sukhomlinskiy. I committed to memory an idea of his, which subsequently was fully confirmed in my practical experience. You have to indoctrinate people into being collectivists, teach them to approach every question from the standpoint of the whole, to work and live as a collective, helping one another in all things and being concerned with one another. Reprimand is no substitute for conscience....

Repetiy did not begin on empty ground, as they say. Things also went fairly well with previous technical maintenance unit chiefs. Over a period of many years the unit bore the title of excellent. This made things both easier and more difficult, for people are frequently disinclined to alter their work style if things are taking their normal course, so to speak. Nor were the technical maintenance people in a hurry to adopt innovations. Nevertheless a time of changes had come. It was becoming increasingly more obvious that predominantly administrative-fiat methods of management, which had been employed in the unit in the past, had exhausted their utility.

Change in the overall climate in our country, the development of a democratic spirit, and increased respect toward the individual greatly helped in establishing a new approach to things in the unit.

"I too," Ivan Vasilyevich commented in the course of our conversation, "have become a different person in the course of these years. This is perhaps logical. We teach our subordinates, and we learn from them. And there is a great deal to learn from our people. They are highly competent at their job!"

Repetiy indeed knows his men well. One of his closest aides is Gds Capt V. Isakov, technical maintenance unit party buro secretary and chief of the avionics maintenance group. He is a genuine soldier. And his men are well matched to him—convinced and with stick-to-itiveness. This is the reason why they are leaders in socialist competition. Other group chiefs are also strong performers: Gds Capts N. Alekseyev and P. Tishchenko. Gds Maj V. Koryakovtsev, who recently returned from Afghanistan to assume the duties of TECH deputy chief for political affairs, Komsomol committee secretary Gds Sr Lt S. Smolin, and subunit ranking NCO Gds Sr WO V. Bakin work shoulder to shoulder with Ivan Vasilyevich.

Where to begin? Fairly recently this question faced Repetiy point-blank, so to speak.

"The first thing that had to be done, without which we could not move forward," smiled Ivan Vasilyevich, "was

to look back and sort out what had been accomplished: what have you done well, what can be utilized and further developed, and what has become hopelessly obsolete? This sorting process helps find unutilized reserve potential. Refinement and detailing are needed, it is true. Sometimes simply the opportunity to eliminate elementary lack of organization, incompetence, etc is called reserve potential. This is certainly important, but truly substantial reserve potential is found in an atmosphere of innovativeness and general enthusiasm. In such an atmosphere one can accomplish much more work with the same expenditure of labor, and high-quality work at that."

A great deal being done in the technical maintenance unit began as an experiment, initially on a small scale, and later, if successful, on an expanded basis. The unit command element was very helpful, especially Gds Lt Col S. Yurko. Together they went over and revised the inspection and maintenance schedule and critically evaluated the system of inspecting and checking off maintenance procedures which currently existed in the technical maintenance unit. They did a time-and-motion study at the most critical bottleneck points. And they came to the realization that the former system contained many flaws and encouraged a lip-service attitude. The group chiefs were physically incapable of performing the volume of checkoff inspections prescribed by regulations. This meant that they were forced simply to sign off some maintenance procedures without an eyeball inspection. Circumstances impelled people onto the path of dishonesty.

They began thinking about how to get free of the fetters of outdated procedural regulations. They refined and detailed a list of maintenance procedures requiring signoff inspection, limiting this list only to truly essential, key maintenance procedures. Following approval by the unit methods council aviation engineer service section, the list became official. The volume of checkoff inspections had been reduced, while quality of servicing and maintenance procedures improved by increasing people's responsibility and improving work organization.

These new changes have made it possible more precisely and, most important, promptly to spot problems and correct them before returning a helicopter back to the squadron. Here is an example. Inspecting installation of an engine regulator pump air filter assembly performed by helicopter airframe and powerplant maintenance group senior mechanic Gds WO I. Berlov, group chief Gds Capt P. Tishchenko noted that the installed assembly had not been properly safetied. Was this mechanic negligent? No hasty conclusions were drawn. This was no open-and-shut case. It was necessary to consider the specific design features in performing the safetied procedure, and only a highly-qualified maintenance specialist was capable of this. Berlov lacked the experience. The incorrect procedure was thoroughly analyzed with all group personnel, and changes were made

in the maintenance procedures documents. Thus everybody learned from one individual's mistake.

The search for new forms and methods of organization of work procedures in the technical maintenance unit is continuing. One of the paramount tasks is to eliminate work time losses. The following schedule has been tested and approved: the men work on the aircraft up to lunch, while mandatory commander training classes are held in the afternoon. Refurbished training facilities make it possible to conduct these classes in a lively and interesting manner. The classes are held in a formerly abandoned building. All technical maintenance unit personnel worked on repairing and refurbishing the building. This was not only a technical but also a political measure: establishment of a training facility helped each and every officer, warrant officer, NCO, and primary-rank enlisted man perceive that he was a fundamental participant in daily events and helped him understand his role and responsibility, which is very important.

How had things been in the past? On paper everything seemed to be just fine. We have minutes of conferences and meetings with the principal agenda dealing with increasing responsibility, and yet there was no improvement, because the maintenance people did not feel that they were in charge of their workplace. And without this there is neither conscientiousness nor initiative. How sincerely surprised we sometimes are at the fact that there is a lack of supervisor candidates coming up from the ranks, and yet at the same time with our excessively close supervision we kill off all tender shoots of independence in future command personnel.

Independence is a complicated, double-edged weapon. It raises the strong and breaks the weak. To be independent is to be bold, competent, skillful, and determined. Of course it is much simpler and less trouble to look to one's superiors and to be an accommodating yes-man even in the face of ridiculous instructions....

Repetiy is a man of a different cut. He himself was never a blind executor of orders and teaches his subordinates to do likewise. The main thing for him is the job. This is his criterion and, incidentally, not only his alone. His assistants take a similar position. It is certainly for good reason that the people in the regiment call the technical maintenance unit a little service academy. Only specialist personnel who have received schooling in the technical maintenance unit are appointed to positions of authority in the unit. Gds WOs N. Makeyenko, N. Vasin, N. Dubnyanskiy, and V. Volkov were recently made flight technician [crew chief]. They gained their professional experience and know-how in the technical maintenance unit.

To the outsider it would seem that Repetiy has no particular problems.

"You know what element is the most difficult for the commander in training and indoctrination of specialist personnel?" Ivan Vasilyevich squeezed his fingers into a

fist, as if hiding something in his hand, and then opened his hand, with apparent effort. "The hardest thing is to hand over a subordinate, into whom you have placed so much of your own soul, to an 'outsider,' who will be reaping the fruits of your labor. It is not easy to develop a competent maintenance specialist, but it is even harder to give him up. This kind of commander greediness has destroyed many careers! But in the final analysis the greedy one is the loser, for a person is a delicate tool, if I may use the analogy, that changes in relation to how he is treated. This also applies to his work effort. It is important precisely to determine when a subordinate is ready for advancement. It is dangerous to be too hasty: he may not be able to handle the new position and lose faith in his ability. But it is also undesirable excessively to delay promotion—he may lose his prospects for growth. It is a real shame when a person loses interest in his job without having realized his capabilities and dreams, himself becoming ignited and igniting others."

How can one avoid mistakes in advancement and promotion? Naturally the commander has the final word. But at the same time one should not ignore group opinion when discussing a potential candidate. Without group opinion it is difficult to reach an objective evaluation of an individual and to help him more fully see his own virtues and shortcomings.

But technical maintenance unit personnel do not live by work alone. Job-related activities are the cornerstone of the collective, but cohesiveness cannot be achieved if this is the only stone. Work with the families of military personnel is well organized in the technical maintenance unit. Many take part in amateur performing arts, and those who cannot bring themselves to step onto the stage become well-wishing, enthusiastic spectators. Thus there are many common interests which unite and cement the collective.

Time passes, and people advance. Gds Sr Lt V. Vasin, who had served in the technical maintenance unit as inspection station chief, was appointed regimental helicopter airframe and powerplant engineer, and subsequently enrolled at the academy. Technical maintenance unit deputy chief Gds Capt V. Ugryaninov was promoted. Incidentally, he too is enrolled at the academy. Former inspection station chief Gds Sr Lt T. Ferley was made squadron airframe and powerplant maintenance group chief.

Specialist personnel who have served in the technical maintenance unit also work with initiative and innovativeness in their new job. Gds Capt G. Starov, for example, who was in charge of the airframe and powerplant maintenance group in the regimental technical maintenance unit, after being promoted to squadron deputy commander for aviation engineer service, did a great deal to bring proper order and procedure to the unit. There were difficulties. Specific comments were made, as well as comments to the effect that the squadron is not the technical maintenance unit. The implication was that the daily routine should not be so

rigidly regimented. Now everybody is satisfied: work is proceeding in an orderly manner, and the situation of last-minute rush work has disappeared. The squadron's aviation engineer service specialist personnel, just as other personnel, did a fine job in neutralizing the consequences of the disaster at the Chernobyl nuclear power plant. Starov was promoted to the rank of major.

Many outstanding specialist personnel and aviation engineer service supervisors have come from this technical maintenance unit. But it has not become talent-impooverished. No wonder they say that trust inspires. Sr Lt Yu. Koryak, the unit's best efficiency innovator, Gds Lt V. Struchkov, Gds Sr WOs I. Shkvyrya and N. Alekseyev, Gds WO V. Kirpita, and other specialist personnel are maturing and becoming more energetic. Ivan Vasilyevich speaks the names of his men with such pride and affection! And if a commander is greatly concerned for his men, this is the best indicator of the health of the unit, its strength and ability to handle any and all tasks.

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Soviet Arms Reduction Initiatives Praised

91441174s Moscow AVIATSIYA I KOSMONAVTIKA
in Russian No 1, Jan 89 (signed to press
5 Dec 88) pp 46-47

[Article, published under the heading "Today's World and the New Thinking," by Candidate of Philosophical Sciences Col A. Fedurin and Maj V. Ovsyannikov: "From Concept to Reality"]

[Text] 15 January 1986 is a signal date in the calendar of peace fashioned by the efforts of progressive mankind. Three years ago M. S. Gorbachev, General Secretary of the CPSU Central Committee, presented a declaration which became a point of departure for positive changes in relations between peoples. This document formulated a number of major foreign-policy actions, the core of which is a program calling for a phased build-down resulting in a nuclear-free world by the beginning of the 21st century.

The Soviet Union's long-term antinuclear initiative evoked extensive response in the West. Signing of a first agreement on nuclear arms reduction took place the following year—the Soviet-American INF Treaty. This was followed by a summit meeting in Moscow, at which the parties exchanged the documents putting the treaty into force, followed by the first phase of public elimination of nuclear missiles. And all this became possible thanks to a revolutionary breakthrough in grasping contemporary realities, which was dubbed the "new political thinking."

The new political thinking is a result of realistic application of dialectical-materialist teaching to cognition of the conflictive world political process. Thanks to this

thinking, Soviet disarmament initiatives and other concrete steps in the international arena received a solid and promising scientific foundation.

Wherein lies the strength of this modern methodology of intergovernmental relations, which is already producing very promising results?

The concept of new political thinking is a system of views which presupposes moving mankind out of an impasse onto the path of progressive resolution of urgent global problems. The root theoretical issue of this concept is the primacy of elements pertaining to mankind as a whole over class elements in actual world development and, consequently, in politics as well.

This applies first and foremost to military policy. The destructive capabilities of modern armed forces are such that unleashing war with the employment not only of nuclear arms but of precision conventional weapons as well, in conditions of highly-developed nuclear engineering and chemical industry, will result in destruction not only of the opposing sides but of all civilization as well. It is therefore logical to ask the question of whether war makes sense today as a means of achieving political objectives.

Not only war but military preparations as well present a threat to the future of mankind. It is no secret that the industrial states are spending vast material and manpower resources on the arms race. As Western experts note, it is planned to spend approximately 71 billion dollars up to 1993 just on SDI research alone. Even today, at the research phase, SDI is comparable in its economic outlays to such major Pentagon programs as development of the MX missile and the B-1B bomber.

The global immorality of militarization lies in the fact that the West is concealing its military preparations behind "peace-seeking," "defensive" rhetoric and demagogic argument to the effect that "nuclear weapons will continue in the future playing a vitally essential role in preventing war." Certain reactionary circles are nurturing plans to modernize nuclear missile arms and to "compensate" for the intermediate-range and shorter-range missiles being eliminated pursuant to the Soviet-American INF Treaty.

Such measures include, in particular, deployment in Western Europe of up to 60 U.S. F-111 fighter-bombers in addition to 150 deployed aircraft of the same type—nuclear weapon delivery platforms capable of reaching Soviet soil. They also include redeployment to Italy of 72 U.S. Air Force F-16 fighters turned away by Spain. It is also planned to increase the offensive capabilities of strike aviation, arming aircraft with air-to-surface missiles with a range capability in excess of 300 km. The Pentagon recently decided to resume work on development of a communications system designed to function during a nuclear war. All this is taking place to the traditional propaganda accompaniment of claims of the "possibility of a Soviet preemptive strike."

In order to knock a breach in this vicious circle, our country firmly declared: Not only a nuclear war proper but also preparations for nuclear war, that is, an arms race, and efforts to gain military superiority cannot objectively bring political gain to anybody.

We should note that efforts are not limited merely to proclaiming theoretical postulates. In recent years there have been many manifestations of good will on the part of the Soviet Union jointly with the brother socialist countries and their willingness to take the most radical steps for the sake of lessening confrontation and eliminating the threat of war. One such step is the adoption of a new plan by the Warsaw Pact member states on reduction of military forces and arms in Europe. It provides for implementation in three phases, with Warsaw Pact and NATO military forces ultimately given a purely defensive character, and limiting their military potential to a level excluding the possibility of carrying out a sneak attack.

The same methodological principle infuses the new Soviet proposals on Asian security presented in Krasnoyarsk by M. S. Gorbachev, General Secretary of the CPSU Central Committee and chairman of the Presidium of the USSR Supreme Soviet. Aware of the concern on the part of Asian and Pacific nations, the Soviet Union will not increase quantities of any nuclear weapons in this region, a practice it has in fact been following for some time now.

Other initiatives include the proposal for a multilateral discussion of the possibility of reducing military confrontation in areas where the coastlines of the USSR, PRC, Japan, the Democratic People's Republic of Korea, and South Korea converge, with the aim of establishing a freeze on and proportionate reduction in levels of naval and air forces.

The timeliness of such initiatives is without question. The Far East, not without U.S. assistance, we might add, had figuratively speaking begun to be transformed into a powder keg. Japan, for example, has more than doubled its military expenditures in the last 10 years, as a result of which it is now in eighth place worldwide in military expenditures, and third among nonnuclear countries. In some categories of military hardware it has not only caught up with but has outstripped the NATO countries. According to a report in the magazine KOKUBO, by 1990 the Japanese Air Force will take delivery on 200 modern F-15 fighters and pull apace with air forces based in the Continental United States.

Why does Japan, whose territory is barely more than four percent as large as U.S. territory, need as many fighters as the United States? The official reply is that it is for defense against the Soviet military threat. The idea of possible involvement in combat operations against the USSR is being pushed on Japanese military personnel. Here is what is stated in a report entitled "The Military Threat and Japan's Defense Strategy," prepared by the Japanese Center for Strategic Studies. If the U.S.

Air Force launches an airstrike on Soviet bases on Sakhalin, in the Central Maritime Region and on the Kuril Islands, "it may be necessary for Japanese military personnel to take part in these offensive operations." They will consist in "independently and aggressively striking forward (read Soviet) bases in the northern territories, on Sakhalin and in other regions." These plans are not merely on paper. Preparations for their execution are being rehearsed in combined Japanese-U.S. exercises. Thus Japan is being transformed into an accomplice in U.S. global military adventures.

This policy is fostering an increase in the level of balance of military potential, including nuclear. But at present this level only ensures equal danger. Security in the context of the new political thinking is guaranteed not by an extremely high but rather an extremely low level of strategic parity, from which both nuclear and other weapons of mass destruction should be excluded. This idea was contained in the address by USSR Minister of Foreign Affairs E. A. Shevardnadze at the 43rd Session on the UN General Assembly.

Genuine security can be achieved only by political means, free of ideological disagreements and conflicts. The aim is not for socialism and capitalism to sacrifice their ideologies for the sake of the survival of mankind but rather for the rivals to get rid of ideologized approaches to forming intergovernmental relations and to be able to rise above ideological disagreements in matters of war and peace, which embody the interests of all mankind. Ideologies may be polar opposites, but the interest of survival and preventing war is universal and supreme. For this reason the Soviet Union advocates deideologization of international relations, and in particular the exclusion of the "image of the enemy" from political dialogue.

The impression is created, however, that in the West they are having great difficulty in parting with this stereotype from the "cold war" days, a stereotype which is convenient for militarism. As substantiation we shall cite the U.S. magazine MILITARY REVIEW. Its authors write both of "the West's growing concern over a conventional-arms blitzkrieg launched by the Soviet and the Warsaw Pact in NATO's Central Region," about "the growing specter of direct Soviet military intervention throughout the world," and about our MiG-29 aircraft as a "threat of Soviet air superiority over the West," but not about innovative approaches in Soviet military policy. We feel that such a tendentious and distorted picture of the Soviet Union will not give anybody any additional confidence about the future.

The new thinking signifies rejection of the illusion that in the nuclear age security can be obtained through military technology. Today international disputes can be resolved only by political means, through dialogue, and with the participation of all interested parties. No matter how great the differences in countries' political and

social systems, the main thing today is the interdependence and interlinkage of the world as a whole and of the individual countries.

In this connection we should also mention such a key element of the new political thinking as freedom of choice. It is dictated by the world's growing diversity. No one state can dictate or impose its own ideological and political schemes on other peoples, even if in that country's opinion these ideological and political schemes are correct.

Freedom of choice of path of development is absolute and cannot be halted by "crusades," but can only be acknowledged. Today the interests of mankind as a whole should be constructed taking into account the interests of all peoples and countries. Our country is undertaking consistent steps to defuse crisis situations on a basis of justice, fairness, and honesty. The Geneva accords pertaining to a political settlement of the Afghanistan question are a genuine manifestation of these efforts. This model is fully applicable to resolving conflicts in Southern Africa, in the Near East, and in Central America, where international law is being constantly violated.

At the special session of the USSR Supreme Soviet in October 1988 M. S. Gorbachev emphasized: "Our course in international affairs is clear. It is a course directed toward eliminating the danger of nuclear catastrophe, toward normalization of international relations, establishment of relations between the world's countries and peoples grounded on equal rights and mutual benefit, at extensive cooperation in the most diverse areas, and at securing for every people the right freely to choose its own destiny." Some impetuous individuals interpreted these words to mean an immediate rejection of the military and are preaching pacifistic attitudes. One must clearly understand, however, that absolute effectiveness of the new thinking is possible in conditions of universality, worldwide winning over of the minds of peoples and their governments. And until such time as a reliable political mechanism for preventing war has been created, a high degree of combat readiness on the part of our Armed Forces, including the members of our Air Forces, will play a genuine role of guarantor of the peaceful labor of the Soviet people.

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Publication Data

91441174u Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 1, Jan 89 (signed to press 5 Dec 88)

[Text] English title: AVIATION AND COSMONAUTICS

Russian title: AVIATSIYA I KOSMONAVTIKA

Editor: O. A. Nazarov

Publishing house: Voenizdat

Place of publication: Moscow

Date of publication: January 1989

Signed to press: 5 December 1988

COPYRIGHT: "Aviatsiya i kosmonavtika", 1989.

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